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ABSTRACT

The courses, seminars and workshops given at the ten regional centers of the Institute for Air Pollution Training and university air pollution training programs sponsored by the Environmental Protection Agency are described in this directory. The Institute's primary objective is to develop and improve the skills and knowledge of individuals in air pollution control activities. The Institute utilizes a new three-tier plan for training air pollution control personnel. Tier one, orientation courses, consists of packaged individualized instructional courses supplied to state and local agencies to enable a new employee to begin his training immediately after reporting on the job. A three week basic course in the principles and practices of air pollution control forms the second tier. The third tier includes a number of highly specialized advanced courses, usually at the graduate level, ranging from one to several weeks in duration. The university programs include both graduate and undergraduate programs, with the listings describing briefly the purpose, content, and requirements of these programs, including the air pollution fellowship program. Course application forms are included. (PR)

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AIR POLLUTION TRAINING COURSES JULY 1971 THROUGH JUNE 1972

AND UNIVERSITY TRAINING PROGRAMS

ENVIRONMENTAL PROTECTION AGENCY

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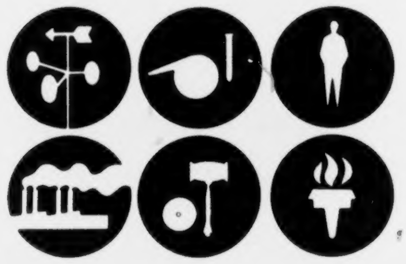
Air Pollution Training Courses July 1971 through June 1972 and University Training Programs



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Extramural Programs

Institute for Air Pollution Training

Planning and Special Projects

ENVIRONMENTAL PROTECTION AGENCY
Research Triangle Park, North Carolina 27711
July 1971

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ENTAL PROTECTION AGENCY

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Planning and Special Projects

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Research Triangle Park, North Carolina 27711
July 1971

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422-A, 422-B and 422-C

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Engineering
and Enforcement Section

Air Pollution Control Tech
(course 431)
Combustion Evaluation
(course 427)
Control of Gaseous Emissi
(course 415)
Control of Particulate Emi
(course 413)
Field Enforcement
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Source Sampling
(course 450)
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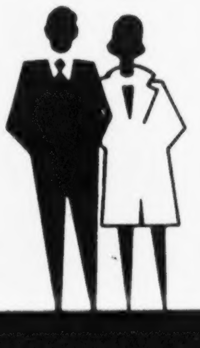

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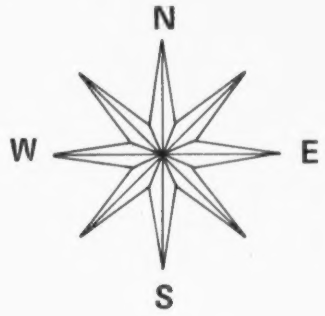

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The Office of Manpower Development, is scheduled to move during the summer of 1971, to the new Technical Center building Research Triangle Park, North Carolina.

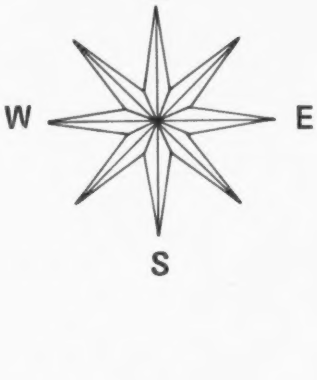
Durham 15 miles ● Duke University

Chapel Hill 12 miles ● University of North Carolina

Research Triangle Park ● Institute For Air Pollution Training
Office of Manpower Development

6 miles Raleigh-Durham Airport RDU Served by several major airlines

●
North Carolina State University
Raleigh 16 miles



INTRODUCTION

On December 2, 1970, the President created the Environmental Protection Agency, naming William Doyle Ruckelshaus, as Administrator. Including air pollution, water pollution, solid wastes, radiation protection, and pesticides, the new Agency possesses a greatly strengthened ability and unique coherence in the struggle for improvement and control of the quality of man's environment.

In the same month, the President signed the Clean Air Act of 1970. The impact of this action on both the public and the private sectors of the country will be far-reaching. The Act creates a demand for more and better trained practitioners in the field of air pollution control. It is to this intensified demand that the Office of Manpower Development of the Office of Air Programs, addresses itself.

During Fiscal Year 1970, 2,410 trainees completed courses conducted by the Institute for Air Pollution Training; during Fiscal Year 1971, 2,700 trainees completed Institute courses.

Through university training programs administered by the Extramural Programs Branch of the Office of Manpower Development, the follow were trained during Fiscal Year 19

72 Technician
70 Bachelor of Science
155 Master of Science
100 Doctor of Philosophy
8 Post Doctoral

During Fiscal Year 1971:
250 Technician
100 Bachelor of Science
192 Master of Science
60 Doctor of Philosophy
8 Post Doctoral

The Office of Air Programs has supported the following number individual fellows to complete spec research projects:

Fiscal Year 1970 65
Fiscal Year 1971 39

The first environmental course signed and developed in the compu -assisted instructional mode, "Int duction to Air Pollution Control," completed, demonstrated, and int duced in a university curriculum. plication will be greatly expand during Fiscal 1972. Extensive use this course is anticipated in colle and universities. This course will be used for orientation of new pro sional and semiprofessional employ in air pollution control agencies the Office of Air Programs.

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During Fiscal Year 1971:
250 Technician
100 Bachelor of Science
192 Master of Science
60 Doctor of Philosophy
8 Post Doctoral

The Office of Air Programs has also supported the following number of individual fellows to complete specific research projects:

Fiscal Year 1970	65
Fiscal Year 1971	39

The first environmental course designed and developed in the computer-assisted instructional mode, "Introduction to Air Pollution Control," was completed, demonstrated, and introduced in a university curriculum. Application will be greatly expanded during Fiscal 1972. Extensive use of this course is anticipated in colleges and universities. This course will also be used for orientation of new professional and semiprofessional employees in air pollution control agencies and the Office of Air Programs.

In conjunction with the University of Southern California, and the University of Michigan, the Office of Manpower Development has developed a computer-based simulation exercise identified as APEX (Air Pollution Exercise). This program establishes a dynamic atmosphere for trainees to participate in the operation of a "real world" simulation involving a community which contains urban as well as rural problems and industrial activities. Emphasis is placed upon air pollution control needs. During the coming year, APEX will be scheduled at a number of universities across the country as a credit course at the graduate level.

Additionally, preparations are underway to introduce APEX as a graduate course at OAP's new Technical Center in the fall of 1971 for students from the Triangle Universities Consortium. In addition to its use at the University of Southern California, APEX is now being conducted as a graduate course at the University of Illinois at Urbana and at Harvard University as part of an Environmental Education program for both graduate and undergraduate studies.

University consortia on air pollution have been formally established in the New England area, the Pacific Southwest area, and the Research Triangle area of North Carolina. These consortia provide a means to facilitate and coordinate cooperative action among and by universities in the battle to achieve clean air. A consortium provides an opportunity for a university in the offering of both a broader and an improved program spectrum, without overreaching its resources, in an attempt to cover the diverse and complex air pollution control field. Additionally, a consortium will encourage and offer assistance to governors, legislators, and councilmen through special educational and advisory arrangements. Stronger representation of faculty on air pollution control boards is a strong objective. Efforts are currently underway to establish consortia in a few other sections of the nation.

The Institute for Air Pollution Training, headquartered at Research Triangle Park, North Carolina; designs, develops and conducts a variety of training courses, seminars, and workshops. The Institute's primary objective is to develop and improve the knowledge and skills of personnel employed in air pollution control activities. To implement the Environmental Protection Agency's decentralization policy—designed primarily to bring expertise to local problem areas—the Institute for Air Pollution Training has expanded its course offerings to the following regional training locations: Austin, Texas; Boston, Massachusetts; Chicago, Illinois; Cincinnati, Ohio; Denver, Colorado; Kansas City, Missouri; New York, New York; San Francisco, California and Seattle, Washington areas.

This year the Institute for Air Pollution Training presents a new three-tier plan for training air pollution control personnel:

1st Tier – Orientation Courses

These are packaged individualized instructional courses, to be supplied to State and local agencies, and will enable a new employee to begin his training immediately after reporting on the job. Where feasible the Computer-Assisted Instructional Course will also be used for this purpose.

2nd Tier – Basic Course

"Principles and Practice of Air Pollution Control," is the basic training course. This 3 – Week course provides a broad understanding of air pollution control, in addition to the development and application of selected skills. It is scheduled to run almost continuously at the new Office of Air Programs Technical Center in the Research Triangle Park, North Carolina. This basic course–or its equivalent in graduate training or air pollution control experience–is the prerequisite for entry into the advanced courses.

3rd Tier – Advanced Courses

A number of advanced courses are conducted by the Institute for Air Pollution Training. These highly specialized courses range from one to several weeks in duration. These courses, usually at the graduate level, provide intensive training in the current elements and methodology of air pollution control. Several of the courses provide opportunities for extensive laboratory practice.

Harry P Kramer
Director,
Office of Manpower Development

The Manpower Developme

January

Chairman
Kenneth G. Picha, Ph.D.
Dean, School of Engineering
University of Massachusetts
Amherst, Massachusetts 01002

Arthur A. Atkisson, D.P.A.
Director, Institute of Urban
Health and Ecology
School of Public Health
University of Texas
Houston, Texas 77025

Bernard D. Bloomfield, M.S.
Chief, Air Pollution Control Section
Michigan Department of Health
3500 North Logan Street
Lansing, Michigan 48914

Robert E. Carroll, M.D.
Professor and Chairman
Department of Preventive and
Community Medicine
The Albany Medical College
Albany, New York 12208

Benjamin Linsky, M.S.
Professor of Civil Engineering
Department of Civil Engineering
Engineering Sciences Building
West Virginia University
Morgantown, West Virginia 26506

Roy O. McCaldin, Ph.D.
Director, Environmental Health Services
Pima County Health Department
151 West Congress Street
Tucson, Arizona 85721

Paul Urone, Ph.D.
Professor of Analy
Department of Env
University of Flori
Gainesville, Florida

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Kramer
irector,
power Development

The Manpower Development Advisory Committee

January 1, 1971

Chairman
Kenneth G. Picha, Ph.D.
Dean, School of Engineering
University of Massachusetts
Amherst, Massachusetts 01002

Executive Secretary
James C. Cross
Chief, Extramural Programs Branch
Office of Manpower Development
Environmental Protection Agency
Research Triangle Park, N. C. 27711

Arthur A. Atkisson, D.P.A.
Director, Institute of Urban
Health and Ecology
School of Public Health
University of Texas
Houston, Texas 77025

Bernard D. Bloomfield, M.S.
Chief, Air Pollution Control Section
Michigan Department of Health
3500 North Logan Street
Lansing, Michigan 48914

Robert E. Carroll, M.D.
Professor and Chairman
Department of Preventive and
Community Medicine
The Albany Medical College
Albany, New York 12208

Benjamin Linsky, M.S.
Professor of Civil Engineering
Department of Civil Engineering
Engineering Sciences Building
West Virginia University
Morgantown, West Virginia 26506

Roy O. McCaldin, Ph.D.
Director, Environmental Health Services
Pima County Health Department
151 West Congress Street
Tucson, Arizona 85721

Hans A. Panofsky, Ph.D.
Professor of Meteorology
Evan Pugh Research Scholar
Pennsylvania State University
University Park, Pennsylvania 16802

Jean J. Schueneman, M.P.H.
Chief, Division of Air Quality Control
Maryland State Department of Health
2305 North Charles Street
Baltimore, Maryland 21218

Robert L. Stockman, B.A.
Executive Director, Washington State
Air Pollution Control Board
Washington State Department of Health
15345 N.E. 36th Street
Redmond, Washington 98053

Terry L. Stumph, M.S.
Clark County District Health Department
Post Office Box 4426
Las Vegas, Nevada 89106

O. Clifton Taylor, Ph.D.
Department of Horticulture and
Air Pollution Research Center
University of California, Riverside
Riverside, California 92502

Paul Urone, Ph.D.
Professor of Analytical Chemistry
Department of Environmental Engineering
University of Florida
Gainesville, Florida 32601

Resident Faculty Institute for Air Pollution Training

OFFICE OF MANPOWER DEVELOPMENT

Harry P. Kramer,	B.S., M.S. Chemistry Sc.D., Environmental Engineering

Administrative Office

A. Vernon Flynn,	B.A., History and Political Science
Jo Peele Cooper,	B.A., Business and Economics

Extramural Programs Branch

James C. Cross,	A.B., Psychology
Robert N. Parrette,	M.H.P., Health Administration
Carl R. Sova,	B.S., Biology M.S., Microbiology Ph.D., Microbiology

Planning and Special Projects Office

James E. Bleadingheiser,	B.S., Chemistry Physics Mathematics Pharmacy M.P.H., Radiological Health
Norman L. Dunfee,	B.S., Pharmacy M.P.A., Public Administration
Michael J. Senew,	B.S., Mechanical Engineering M.S., Industrial Administration
Ronnie E. Townsend,	B.S., Physical Therapy M.P.H., Chronic Disease Epidemiology

Institute for Air Pollution Training

Francis J. King,	B.S., M.ED.
George H. Ziener,	B.A., Philosophy
Anne S. Rampacek,	B.M., Music Education M.A., Musicology

Faculty
Engineering an
Institute for Ai

William F. Tod

John A. Bram

D. James Grov

Dennis P. Ho

Imants Krese,

Michael J. Sen

Joseph E. Sick

Walter S. Sm

Faculty
Surveillance ar
of the Institut

Stanley F. Sle
James L. Dick

Alfred H. Cam

Ronald J. Dra
Edward J. Har

Thomas A. Ha
David R. Hick
Ronald C. Hil

Charles D. Pra

Eugene G. Ra
Karl J. Zobel,

OWER DEVELOPMENT

B.S., M.S. Chemistry
Sc.D., Environmental Engineering

ce

B.A., History and Political Science
B.A., Business and Economics

ns Branch

A.B., Psychology
M.H.P., Health Administration
B.S., Biology
M.S., Microbiology
Ph.D., Microbiology

al Projects Office

ieiser,	B.S., Chemistry Physics Mathematics Pharmacy M.P.H., Radiological Health
e,	B.S., Pharmacy M.P.A., Public Administration
	B.S., Mechanical Engineering M.S., Industrial Administration
nd,	B.S., Physical Therapy M.P.H., Chronic Disease Epidemiology

ollution Training

	B.S., M.ED.
	B.A., Philosophy
k,	B.M., Music Education M.A., Musicology

Faculty
Engineering and Enforcement Section of the Institute for Air Pollution Training

William F. Todd,	B.S., Chemistry M.S., Chemical Engineering
John A. Bramblett,	B.S., Engineering M.P.H.S., Environmental Studies
D. James Grove,	B.S., Chemical Engineering M.E., Chemical Engineering
Dennis P. Holzschuh,	Associate of Science Mechanical Engineering Technology
Imants Krese,	B.S., Civil Engineering M.S., Civil Engineering
Michael J. Senew,	B.S., Mechanical Engineering M.S., Industrial Administration
Joseph E. Sickles,	B.S., Chemical Engineering M.S., Chemical Engineering
Walter S. Smith,	B.S., Chemical Engineering

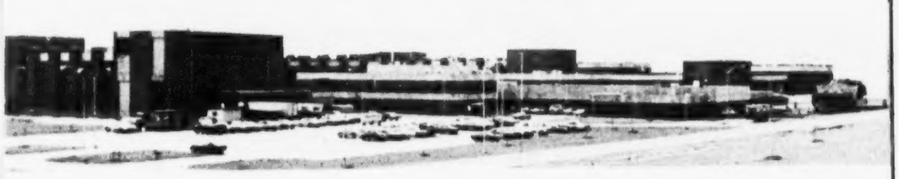
Faculty
Surveillance and Laboratory Techniques Section of the Institute for Air Pollution Training

Stanley F. Sleva,	B.S., M.S., Chemistry
James L. Dicke,	B.A., Chemistry B.S., Meteorology M.S., Meteorology
Alfred H. Campbell,	B.S., Biology M.A., Biology
Ronald J. Drago,	B.S., Chemistry
Edward J. Hanks, Jr.,	Associate of Science Chemical Technology
Thomas A. Hartlage,	B.S., Chemistry
David R. Hicks,	
Ronald C. Hilfiker,	B.S., Atmospheric Science M.S., Meteorology
Charles D. Pratt,	B.S., Mathematics M.P.A. Public Administration
Eugene G. Raybuck,	B.S., Science
Karl J. Zobel,	B.S., Biology M.S., Bacteriology

The Environmental Protection Agency's new Technical Center at Research Triangle

nmental Protection Agency's new Technical Center at Research Triangle Park, North Carolina.

THE ENVIRONMENTAL PROTECTION AGENCY'S NEW TECHNICAL CENTER



EPA•OAP

The Office of Air Programs (OAP) is one part of the newly formed Environmental Protection Agency (EPA) . . . the operating responsibility for the Federal Program in the prevention and control of air pollution is vested with OAP.

The headquarters for OAP,
located in a Washington, D.C. suburb, comprises a staff dedicated to the management and administration of operational programs.

Ten regional offices,
located throughout the country, provide technical assistance in the establishment of air quality standards.

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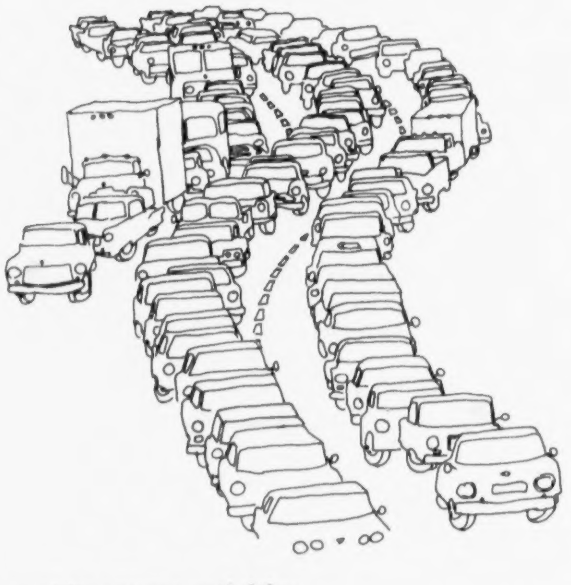
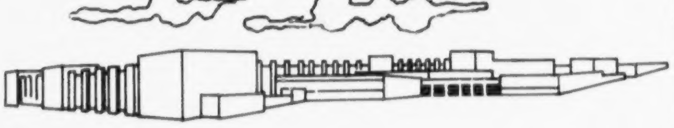


The mobile source activities,
of OAP, located in Ann Arbor, Michigan, and Ypsilanti, Michigan, comprise a professional staff with responsibility for the development of new technology for increased control of pollution from spark-ignited internal combustion vehicles and a development program of advanced power systems.

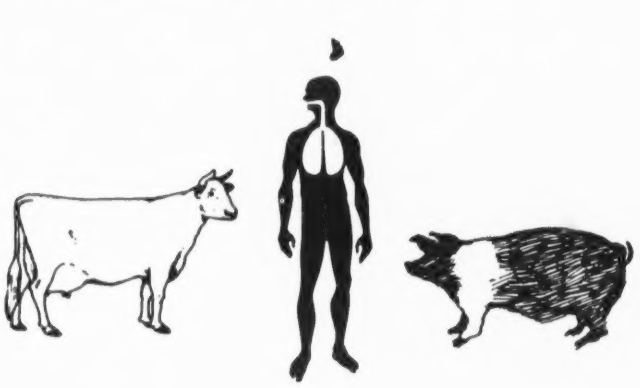


1971

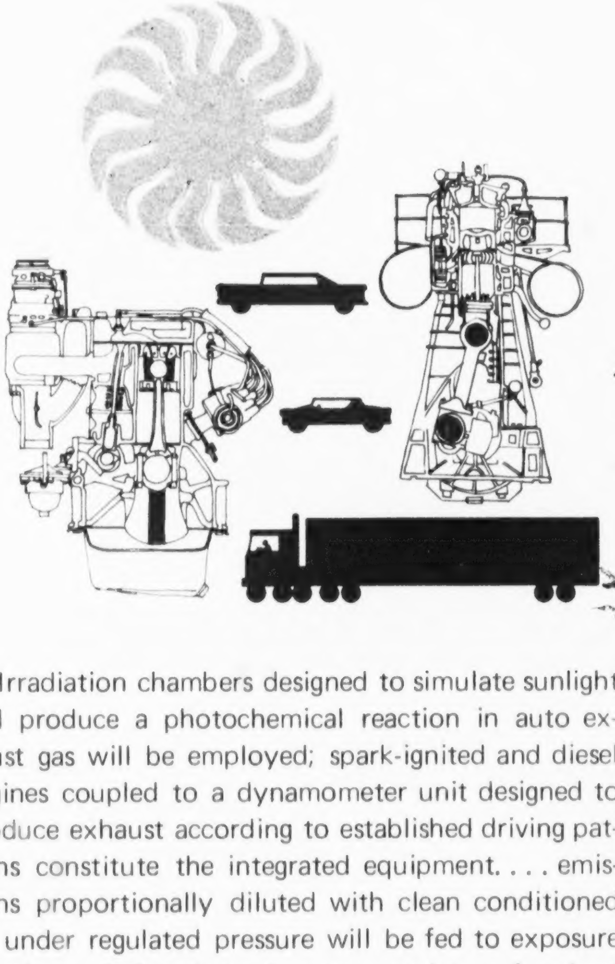
The Technical Center,
to be completely operational in late 1971, will house a varied discipline-oriented staff—chemists, chemical engineers, meteorologists, sanitary engineers, biomedical personnel, technicians, computer specialists. . . . and epidemiologists.

The Technical Center,
located in the Research Triangle Park, North Carolina, encompasses a staff of eight hundred whose talents are directed toward research and development activities to provide the technology to regulate or prevent emissions of pollutants into the atmosphere.

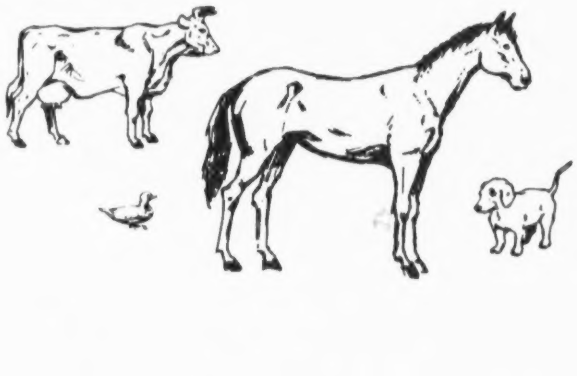
Encompassing fifty acres and 300,000 square feet of working area, the Technical Center is located within close proximity of other research oriented government and industrial organizations . . . Functioning as a self contained facility, the "Center" represents an investment of 25-million dollars, nearly one-quarter of which is directed toward specialized equipment and innovative devices to meet the objectives of the Environmental Protection Agency.

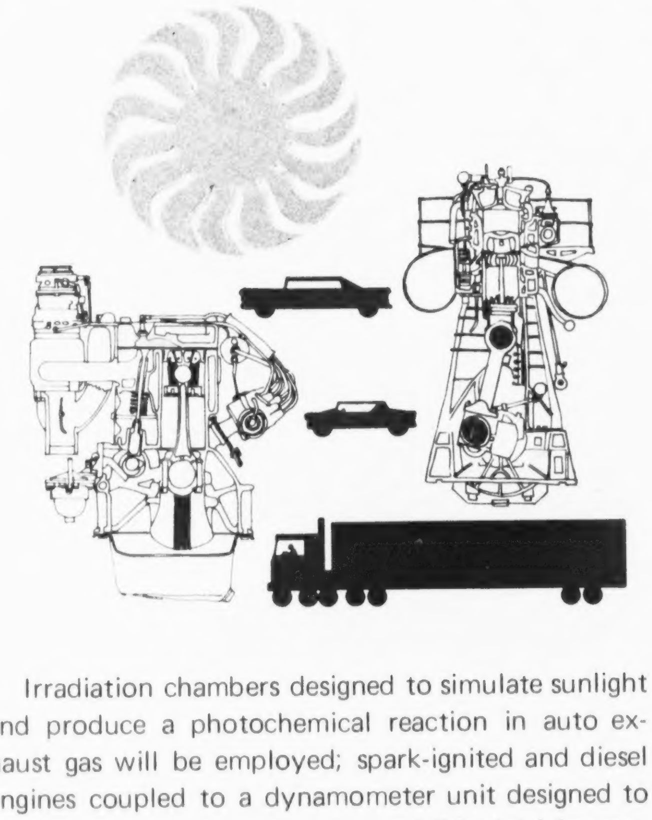


Research activities
relating to health effects will include biologic, physiologic, and toxicological studies as well as laboratory animal studies.

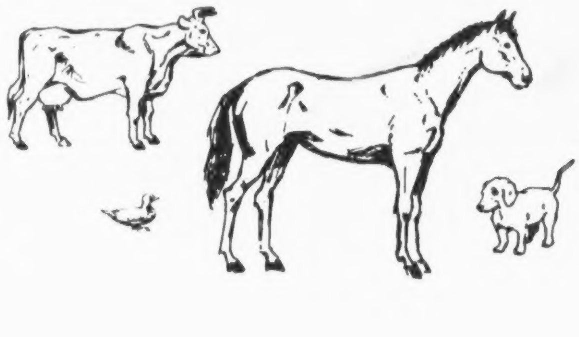


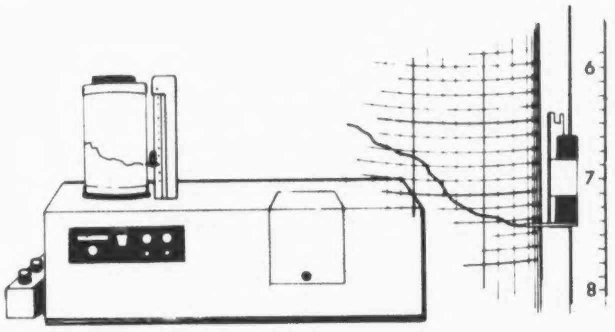
Irradiation chambers designed to simulate sunlight and produce a photochemical reaction in auto exhaust gas will be employed; spark-ignited and diesel engines coupled to a dynamometer unit designed to produce exhaust according to established driving patterns constitute the integrated equipment. . . . emissions proportionally diluted with clean conditioned air under regulated pressure will be fed to exposure chambers designed to house a variety of animal species for extended exposure periods under controlled conditions.



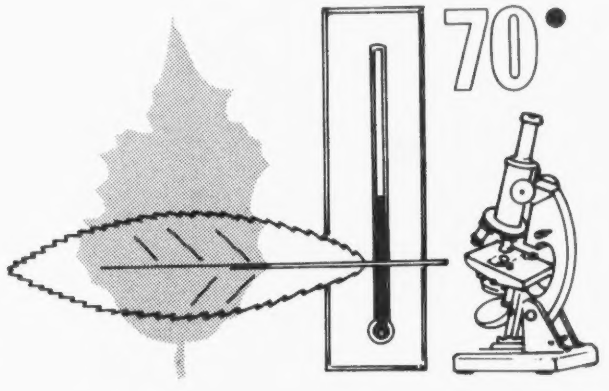


Irradiation chambers designed to simulate sunlight and produce a photochemical reaction in auto exhaust gas will be employed; spark-ignited and diesel engines coupled to a dynamometer unit designed to produce exhaust according to established driving patterns constitute the integrated equipment. . . . emissions proportionally diluted with clean conditioned air under regulated pressure will be fed to exposure chambers designed to house a variety of animal species for extended exposure periods under controlled conditions.

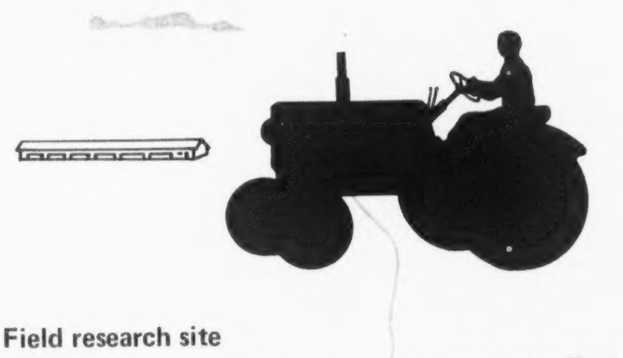




Ancillary equipment
includes tissue culture preparation areas, spectrophotometers for identification of organic and inorganic contaminants, liquid chromatographs for detection and measurement of higher molecular hydrocarbons. . . . particle counters, digital integrators, and gas chromatographs. . . .

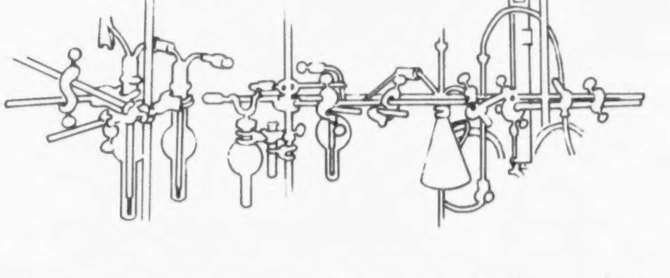


Greenhouse Facility
will have filtered air to remove gaseous and particulate pollutants. Temperature controls of 70° F can be maintained. Plant materials grown in these greenhouses will be exposed under greenhouse, field-plot, and laboratory conditions. There will be two greenhouses, each having four compartments. In each compartment, environmental parameters can be controlled independently.



A Field research site

of approximately twenty acres adjacent to the Technical Center will provide another valuable laboratory for agricultural research efforts. Included on this farm site will be ten acres of land to be used for extensive research plot studies and a farm equipment building to house the necessary support facilities. The Division of Meteorology will monitor all meteorological parameters in support of the agricultural research. To aid in this support there will be a 300 foot meteorological tower. The Soil Conservation Service has assumed a major role in the land development of this site. This has involved an extensive land smoothing and terracing program.



Research activities in the areas of effects of air pollutants on vegetation, plants, animals, livestock, wildlife, materials, paints, structures, metals, plastics, fabrics and dyes will be conducted on a laboratory scale.

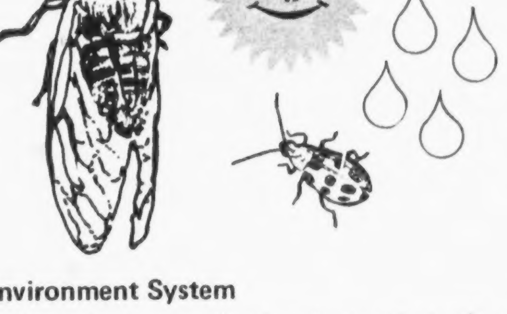
2

Two systems of plant growth chambers will be used:

25 | 10

Controlled Environment System

Twenty-five chambers will be used for plant growth, in a pollution-free atmosphere and in a known reproducible environment. In addition, there will be 10 chambers with separate air supplies in which pollutant exposure can be controlled.



Field Environment System

Twenty-five plant growth chambers, through which ambient air is circulated, will be used with crops planted in the field. In some cases the ambient air pollutants are filtered out prior to the air entering the chambers and in others, pollutants are added in known amounts. Also there are cylindrical chambers, open at the top. The environmental conditions in these chambers follow the real world even more closely than the square chamber in that insects, rain, sunlight, etc., can enter the chambers directly. In these chambers, air is circulated and ambient level pollutant studies can be done or various pollutants can be added as desired.

2

Two systems of plant growth chambers will be used:

25 | 10

Controlled Environment System

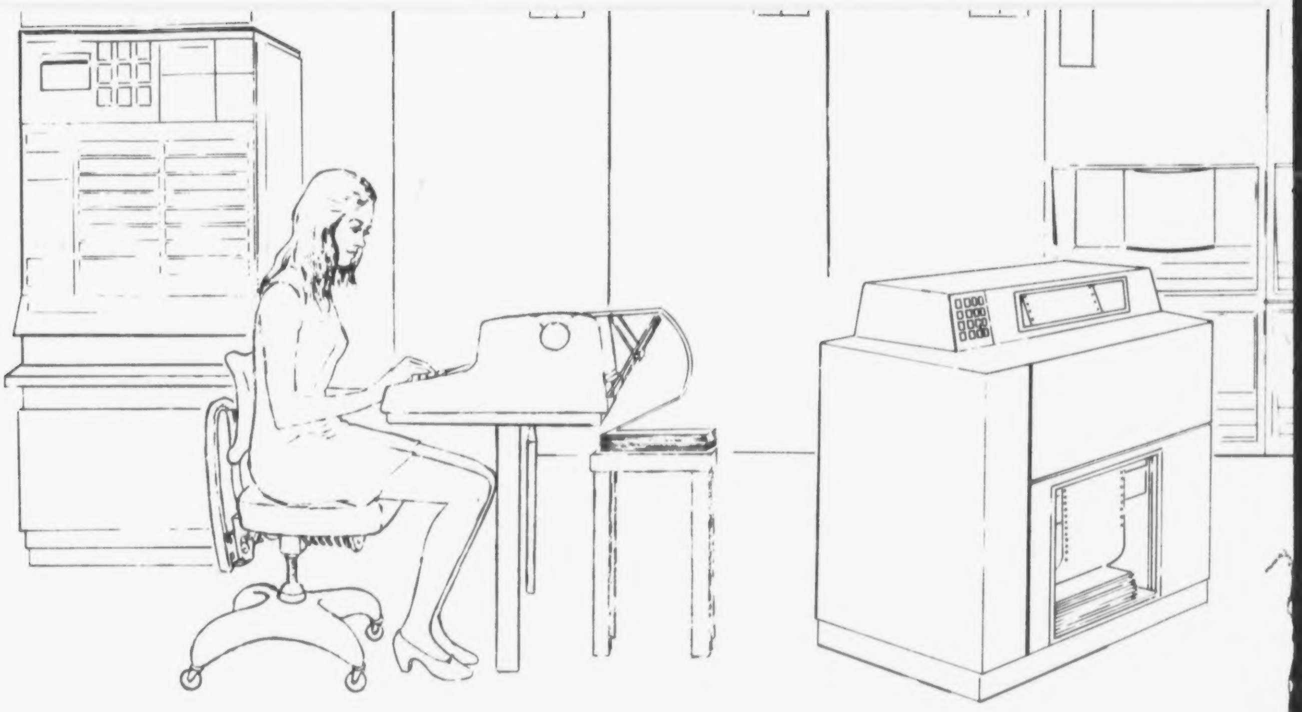
Twenty-five chambers will be used for plant growth, in a pollution-free atmosphere and in a known reproducible environment. In addition, there will be 10 chambers with separate air supplies in which pollutant exposure can be controlled.

Field Environment System

Twenty-five plant growth chambers, through which ambient air is circulated, will be used with crops planted in the field. In some cases the ambient air pollutants are filtered out prior to the air entering the chambers and in others, pollutants are added in known amounts. Also there are cylindrical chambers, open at the top. The environmental conditions in these chambers follow the real world even more closely than the square chamber in that insects, rain, sunlight, etc., can enter the chambers directly. In these chambers, air is circulated and ambient level pollutant studies can be done or various pollutants can be added as desired.

Exploratory research

to evaluate the feasibility of new control processes and concepts; conduct applied research related to specific processes under development. . . . continual research efforts of sampling methods and analytical procedures.



IBM

An IBM System 360 Model 50 is installed in the n
Center. Air quality emission data, meteorological a
relating to areas nationwide will constitute the nation
data base accessible from this central facility. Abstrac
nical literature for the past several years are indexed c
ment.

OMD

The Office of Manpower Development will occupy 2
feet of space in the new Technical Center. Approxim
cent of this space is devoted to laboratories that wil
students attending courses at the Institute for Air Pollu
Other features include an auditorium designed to acco
to 200 people, and three classrooms with a capacity o
each. The classrooms contain the capability for both
tion picture and television projection. A self-instructio
equipped with learning carrels for utilization of com
program material and for individual learning package
able to the students. An additional feature is a 380
television and motion picture studio and sound stag
the production of learning materials; the studio is supp
equipped film editing and processing facilities.

An IBM System 360 Model 50 is installed in the new Technical Center. Air quality emission data, meteorological and effects data relating to areas nationwide will constitute the national air pollution data base accessible from this central facility. Abstracts of the technical literature for the past several years are indexed on this equipment.

The Office of Manpower Development will occupy 28,000 square feet of space in the new Technical Center. Approximately 33 percent of this space is devoted to laboratories that will be used by students attending courses at the Institute for Air Pollution Training. Other features include an auditorium designed to accommodate 150 to 200 people, and three classrooms with a capacity of 50 students each. The classrooms contain the capability for both a central motion picture and television projection. A self-instructional laboratory equipped with learning carrels for utilization of computer-assisted program material and for individual learning packages is also available to the students. An additional feature is a 3800 square foot television and motion picture studio and sound stage designed for the production of learning materials; the studio is supported by fully equipped film editing and processing facilities.

Adjunct Faculty
Institute for Air Pollution Training

The Institute for Air Pol
wishes to acknowledge t
counsel offered by this c
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ARTHUR A. ATKISSON, Ph.D.
Director
Institute of Urban Health and Ecology
School of Public Health
Houston, Texas

L.R. BABCOCK, JR., Ph.D.
Associate Professor
Water Air Resources Program
Department of Energy Engineering
University of Illinois
Chicago Circle, Illinois

NEAL BALANOFF, Ph.D.
Director
Office of Instructional Development
School of Public Health
Harvard University
Cambridge, Massachusetts

JACK G. CALVERT, Ph.D.
Professor
Department of Chemistry
Ohio State University
Columbus, Ohio

LOUIS DICKIE, B.S.M.
Product Supervisor
American Air Filter
Louisville, Kentucky

RICHARD DUKE, Ph.
Professor of Urban
and Regional Plannin
Environmental Simula
University of Michiga
Ann Arbor, Michigan

HEINZ L. ENGELBR
Mechanical Engineer
Consultant
Wheelabrator Corpora
Mishawaka, Indiana

W.L. FAITH, Ph.D.
Industrial Consultant
San Marino, Californi

GERSHON FISHBEIN
Editor
Environmental Healt
Washington, D.C.

JAMES V. FITZPAT
Consulting Engineer
Garden City, New Yor

ARTHUR A. ATKISSON, Ph.D.
Director
Institute of Urban Health and Ecology
School of Public Health
Houston, Texas

L.R. BABCOCK, JR., Ph.D.
Associate Professor
Water Air Resources Program
Department of Energy Engineering
University of Illinois
Chicago Circle, Illinois

NEAL BALANOFF, Ph.D.
Director
Office of Instructional Development
School of Public Health
Harvard University
Cambridge, Massachusetts

JACK G. CALVERT, Ph.D.
Professor
Department of Chemistry
Ohio State University
Columbus, Ohio

LOUIS DICKIE, B.S.M.E.
Product Supervisor
American Air Filter
Louisville, Kentucky

RICHARD DUKE, Ph.D.
Professor of Urban
and Regional Planning
Environmental Simulation Laboratory
University of Michigan
Ann Arbor, Michigan

HEINZ L. ENGELBRECHT
Mechanical Engineer
Consultant
Wheelabrator Corporation
Mishawaka, Indiana

W.L. FAITH, Ph.D.
Industrial Consultant
San Marino, California

GERSHON FISHBEIN, B.A.
Editor
Environmental Health Letter
Washington, D.C.

JAMES V. FITZPATRICK, M.S.
Consulting Engineer
Garden City, New York

GERALD C. GILL, M.S.
Professor of Meteorology
Department of Meteorology
and Oceanography
University of Michigan
Ann Arbor, Michigan

CHARLES W. GRUBER, M.E., P.E.
Associate Professor
Environmental Health Engineering
University of Cincinnati
Cincinnati, Ohio

CLARK C. HAVIGHURST, J.D.
Associate Professor of Law
School of Law
Duke University
Durham, North Carolina

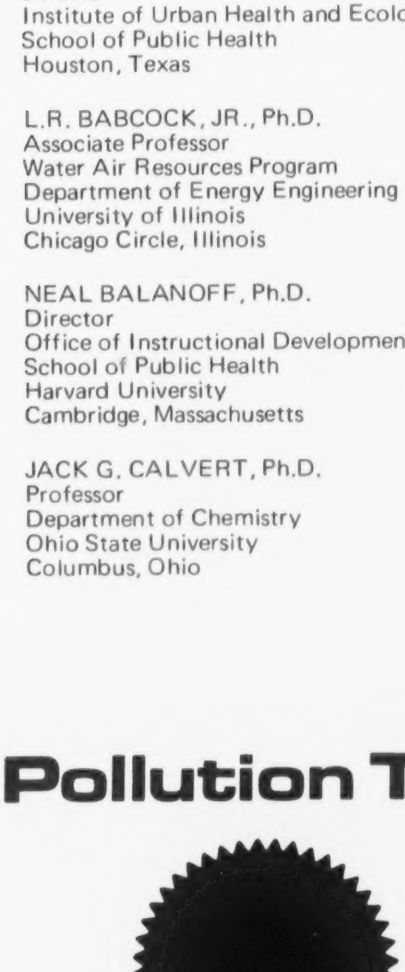
IBRAHIM J. HINDAWI, Ph.D.
Botanist
Division of Effects Research
Office of Air Programs
Research Triangle Park,
North Carolina

MAYNARD M. HUFSCHMIDT, D.P.A.
Professor of Planning and
Environmental Sciences and Engineering
Department of Planning
University of North Carolina
Chapel Hill, North Carolina

JOHN M. KANE, B.S.
Industrial Consultant
Jeffersontown, Kentucky

J. LOUIS KOVACH, Dipl. Ch.E.
Dipl. Ch. Tech.
Vice President
and Director of Research
North American Carbon Company
Columbus, Ohio

culty
or Air Pollution Training



The Institute for Air Pollution Training
wishes to acknowledge the invaluable efforts and
counsel offered by this distingushed group
of scientists and educators.

KENNETH KOWALD, J.D.
Executive Secretary
New York State
Action for Clean Air Committee
New York, New York

RALPH LARSEN, Ph.D.
Director,Modeling Branch
Division of Meteorology
Bureau of Air Pollution Sciences
Office of Air Programs
Durham, North Carolina

K. W. LEFFLAND, D.P.A.
Associate Director
School of Public Administration
University of Southern California
Los Angeles, California

ROBERT LINNELL, Ph.D.
Director
University of Southern California
Los Angeles, California

BENJAMIN LINSKY, M.S.
Professor of Civil Engineering
Department of Civil Engineering
Engineering Sciences Building
West Virginia University
Morgantown, West Virginia

JAMES MAHONEY, Ph.D.
Assistant Professor
of Applied Meteorology
Harvard University
Cambridge, Massachusetts

DAVID BOYD MARSLAND, Ph.D.
Associate Professor
of Chemical Engineering
State University
Raleigh, North Carolina

DANIEL A. MAZZARELLA, A.B.
Vice President
Science Associates, Inc.
Princeton, New Jersey

ROY O. McCALDIN, Ph.D.
Director
Environmental Health
Pima County Health Department
Tucson, Arizona

H. M. McNAIR, Ph.D.
Professor
Department of Chemistry
Virginia Polytechnic Institute
Blacksburg, Virginia

MICHAEL MODELL, Ph.D.
Professor
of Chemical Engineering
Massachusetts Institute of Technology
Cambridge, Massachusetts

DADE W. MOELLER, Ph.D.
Assistant Director
Kresge Center
for Environmental Health
Harvard University
Boston, Massachusetts

WAYNE R. OTT, Ph.D.
Office of the Director
EPA Technical Center
Research Triangle Park, N. C.

HANS A. PANOFSKY, Ph.D.
Professor of Meteorology
Evan Pugh Research Scholar
Pennsylvania State University
University Park, Pennsylvania

AUSTIN PHELPS, B.S., M.E.
Manager
Corporate Air Pollution Control
Proctor and Gamble Company
Cincinnati, Ohio

JAMES PITTS, Ph.D.
Director
Statewide Air Pollution
Statewide Research Center
University of California, Riverside
Riverside, California

SHELDON PLAGER, Ph.D.
Professor of Law
University of Illinois
Urbana, Illinois

JAMES W. ROBINSON, Ph.D.
Professor of Chemistry
College of Chemistry and Physics
Louisiana State University
Baton Rouge, Louisiana

SHELDON W. SAMUELS, Ph.M.
Director, Occupational Health
Safety and Environmental Affairs
Industrial Union Department AFL-CIO
Washington, D. C.

DAVID B. SEBREE, J.D.
Attorney
Division of Government Affairs
E.I. DuPont de Nemours and Co.
Wilmington, Delaware

C. GEORGE SEGELER, P.E.
Director of Technical Services
David Sage, Inc.
New York, New York

JOSEPH J. SOPOROWSKI, M.S.
Professor
Associate Extension Specialist
in Environmental Sciences
Rutgers the State University
New Brunswick, New Jersey

ARTHUR C. STERN, M.E., M.S.
Professor
School of Public Health
University of North Carolina
Chapel Hill, North Carolina

P.R. STICKSEL, Ph.D.
Battelle Memorial Institute
Columbia Laboratories
Columbus, Ohio

RICHARD J. SULLIVAN, M.A., M.P.H.
Commissioner,
Department of Environmental Protectio
State Health Department
Trenton, New Jersey

O. CLIFTON TAYLOR, Ph.D.
Associate Director
Air Pollution Research Center
University of California, Riverside
Riverside, California

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SHELDON W. SAMUELS, Ph.M.
Director, Occupational Health
Safety and Environmental Affairs
Industrial Union Department AFL-CIO
Washington, D. C.

DAVID B. SEBREE, J.D.
Attorney
Division of Government Affairs
E.I. DuPont de Nemours and Co.
Wilmington, Delaware

C. GEORGE SEGELER, P.E.
Director of Technical Services
David Sage, Inc.
New York, New York

JOSEPH J. SOPOROWSKI, M.S.
Professor
Associate Extension Specialist
in Environmental Sciences
Rutgers the State University
New Brunswick, New Jersey

ARTHUR C. STERN, M.E., M.S.
Professor
School of Public Health
University of North Carolina
Chapel Hill, North Carolina

P.R. STICKSEL, Ph.D.
Battelle Memorial Institute
Columbia Laboratories
Columbus, Ohio

RICHARD J. SULLIVAN, M.A., M.P.H.A.
Commissioner,
Department of Environmental Protection
State Health Department
Trenton, New Jersey

O. CLIFTON TAYLOR, Ph.D.
Associate Director
Air Pollution Research Center
University of California, Riverside
Riverside, California

JEROME F. THOMAS, Ph.D.
Professor, Sanitary Engineering
Department of Hydraulics
and Sanitary Engineering
University of California, Berkeley
Berkeley, California

ERNEST TSIVOGLOU, Ph.D.
Professor of Civil Engineering
Georgia Technological Institute
Atlanta, Georgia

AMOS TURK, M.A., Ph.D.
Professor of Chemistry
City College
City University, New York

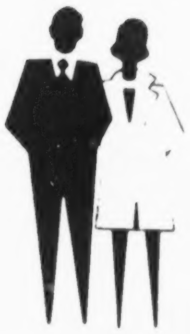
PAUL URONE, Ph.D.
Professor of Analytical Chemistry
Department of Environmental Engineering
University of Florida
Gainesville, Florida

MATTHEW S. WALKER, J.D.
Legal Counsel
Bay Area Air Pollution
Control District
San Francisco, California

GEORGE WILLIAM WALSH, M.S.
Acting Assistant to
the Director, Division of Compliance
Bureau of Stationary Sources
Pollution Control
Office of Air Programs
Raleigh, North Carolina

MARTIN E. WEEKES, J.D.
Deputy Counsel
Los Angeles County
Los Angeles, California

PHILIP W. WEST, Ph.D.
Boyd Professor of Chemistry
Louisiana State University
Baton Rouge, Louisiana



Chronological Schedule 1971 • 1972 Institute for Air Pollution Training Courses

1971 Dates	Course Number	Course Title and Location
July 12-July 31	452	Principles and Practice of Air Pollution Control (Basic 3-Week course, Research Triangle Park, N.C.)
July 13-15	439	Visible Emissions Evaluation (Barre, Vermont)
July 19-23	435	Atmospheric Sampling (Redmond, Washington)
August 2-6	431	Air Pollution Control Technology (Redmond, Wash.)
August 3-5	439	Visible Emissions Evaluation (Anchorage, Alaska)
August 9-August 28	452	Principles and Practice of Air Pollution Control (Basic 3-Week course, Research Triangle Park, N.C.)
August 9-13	450	Source Sampling (Research Triangle Park, N.C.)
August 16-20	435	Atmospheric Sampling (Austin, Texas)
August 17-19	439	Visible Emissions Evaluation (Indianapolis, Indiana)
August 31-September 2	439	Visible Emissions Evaluation (Kansas City, Missouri)
September 7-September 25	452	Principles and Practice of Air Pollution Control (Basic 3-Week course, Research Triangle Park, N.C.)
September 13-17	431	Air Pollution Control Technology (Kansas City, Missouri)
September 14-16	439	Visible Emissions Evaluation (Madison, Wisconsin)
September 20-24	435	Atmospheric Sampling (Denver, Colorado)

1971 Dates	Course Numbe
September 21-23	444
September 27-October 1	450
October 4-8	411
October 4-8	420
October 5-7	444
October 18-22	435
October 18-22	431
October 18-22	450
October 26-28	444
October 26-November 13	452
November 1-5	431
November 9-11	444
November 15-19	450
November 29-December 3	435
November 29-December 3	450
November 29-December 3	431
November 30-December 2	444
December 6-10	420
December 6-10	411
December 13-17	435

1972 Dates	Course Numbe
January 10-14	411
January 10-January 29	452
January 17-21	413
January 18-20	439
January 24-28	415

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1971 Dates	Course Number	Course Title and Location
September 21-23	444	Air Pollution Field Enforcement (Cincinnati, Ohio)
September 27-October 1	450	Source Sampling (Research Triangle Park, N.C.)
October 4-8	411	Air Pollution Meteorology (Denver, Colorado)
October 4-8	420	Air Pollution Microscopy (Redmond, Washington)
October 5-7	444	Air Pollution Field Enforcement (Edison, New Jersey)
October 18-22	435	Atmospheric Sampling (Edison, New Jersey)
October 18-22	431	Air Pollution Control Technology (Denver, Colorado)
October 18-22	450	Source Sampling (Research Triangle Park, N.C.)
October 26-28	444	Air Pollution Field Enforcement (Winchester, Massachusetts)
October 26-November 13	452	Principles and Practice of Air Pollution Control (Basic 3-Week course, Research Triangle Park, N.C.)
November 1-5	431	Air Pollution Control Technology (Research Triangle Park, N.C.)
November 9-11	444	Air Pollution Field Enforcement (Research Triangle Park, N.C.)
November 15-19	450	Source Sampling (Research Triangle Park, N.C.)
November 29-December 3	435	Atmospheric Sampling (Research Triangle Park, N.C.)
November 29-December 3	450	Source Sampling (Research Triangle Park, N.C.)
November 29-December 3	431	Air Pollution Control Technology (Research Triangle Park, N.C.)
November 30-December 2	444	Air Pollution Field Enforcement (Research Triangle Park, N.C.)
December 6-10	420	Air Pollution Microscopy (Research Triangle Park, N.C.)
December 6-10	411	Air Pollution Meteorology (Research Triangle Park, North Carolina)
December 13-17	435	Atmospheric Sampling (Cincinnati, Ohio)

1972 Dates	Course Number	Course Title and Location
January 10-14	411	Air Pollution Meteorology (Research Triangle Park, N.C.)
January 10-January 29	452	Principles and Practice of Air Pollution Control (Basic 3-Week course, Research Triangle Park, N.C.)
January 17-21	413	Control of Particulate Emissions (Research Triangle Park, N.C.)
January 18-20	439	Visible Emissions Evaluation (Research Triangle Park, N.C.)
January 24-28	415	Control of Gaseous Emissions (Research Triangle Park, N.C.)

1972 Dates	Course Number	Course Title and Location
January 24-February 4	409	Analysis of Atmospheric Inorganics (2-Weeks, Research Triangle Park, N.C.)
January 31-February 4	413	Control of Particulate Emissions (Kansas City, Missouri)
February 1-3	439	Visible Emissions Evaluation (Research Triangle Park, N.C.)
February 7-11	415	Control of Gaseous Emissions (Kansas City, Missouri)
February 7-18	426	Statistical Evaluation of Air Pollution Data (2-Weeks, Edison, New Jersey)
February 7-18	409	Analysis of Atmospheric Inorganics (2-Weeks, Research Triangle Park, N.C.)
February 7-February 26	452	Principles and Practice of Air Pollution Control (Basic 3-Week course, Research Triangle Park, N.C.)
February 28-March 3	413	Control of Particulate Emissions (Denver, Colorado)
February 28-March 10	408	Analysis of Atmospheric Organics (2-Weeks, Research Triangle Park, N.C.)
February 29-March 2	439	Visible Emissions Evaluation (Research Triangle Park, N.C.)
March 6-10	415	Control of Gaseous Emissions (Denver, Colorado)
March 6-10	411	Air Pollution Meteorology (Research Triangle Park, N.C.)
March 6-25	452	Principles and Practice of Air Pollution Control (Basic 3-Week course, Research Triangle Park, N.C.)
March 13-17	450	Source Sampling (Research Triangle Park, N.C.)
March 13-24	408	Analysis of Atmospheric Organics (2-Weeks, Research Triangle Park, N.C.)
March 14-16	439	Visible Emissions Evaluation (Research Triangle Park, N.C.)
March 20-24	413	Control of Particulate Emissions (Research Triangle Park, N.C.)
March 27-31	450	Source Sampling (Research Triangle Park, N.C.)
March 27-31	415	Control of Gaseous Emissions (Research Triangle Park, N.C.)
March 28-30	439	Visible Emissions Evaluation (Research Triangle Park, N.C.)
April 10-14	450	Source Sampling (Research Triangle Park, N.C.)
April 10-21	429	Gas Chromatographic Analysis of Air Pollutants (2-Weeks, Research Triangle Park, N.C.)
April 10-April 29	452	Principles and Practice of Air Pollution Control (Basic 3-Week course, Research Triangle Park, N.C.)
April 17-21	405	Identification of Aero-Allergens (Research Triangle Park, N.C.)
April 24-28	450	Source Sampling (Research Triangle Park, N.C.)
April 24-May 5	429	Gas Chromatographic Analysis of Air Pollutants (2-Weeks, Research Triangle Park, N.C.)
April 25-27	439	Visible Emissions Evaluation (Research Triangle Park, N.C.)

1972 Dates	Course Numbe
May 1-5	413
May 1-5	427
May 8-12	415
May 8-19	426
May 8-19	453
May 8-12	411
May 9-11	439
May 22-26	420
May 22-26	450
May 22-26	423
May 30-June 17	452
June 5-9	448
June 5-9	42
June 5-16	43
June 6-8	439
June 12-23	426
June 19-23	41
June 19-30	436
June 26-30	447
June 26-30	415
June 26-30	427

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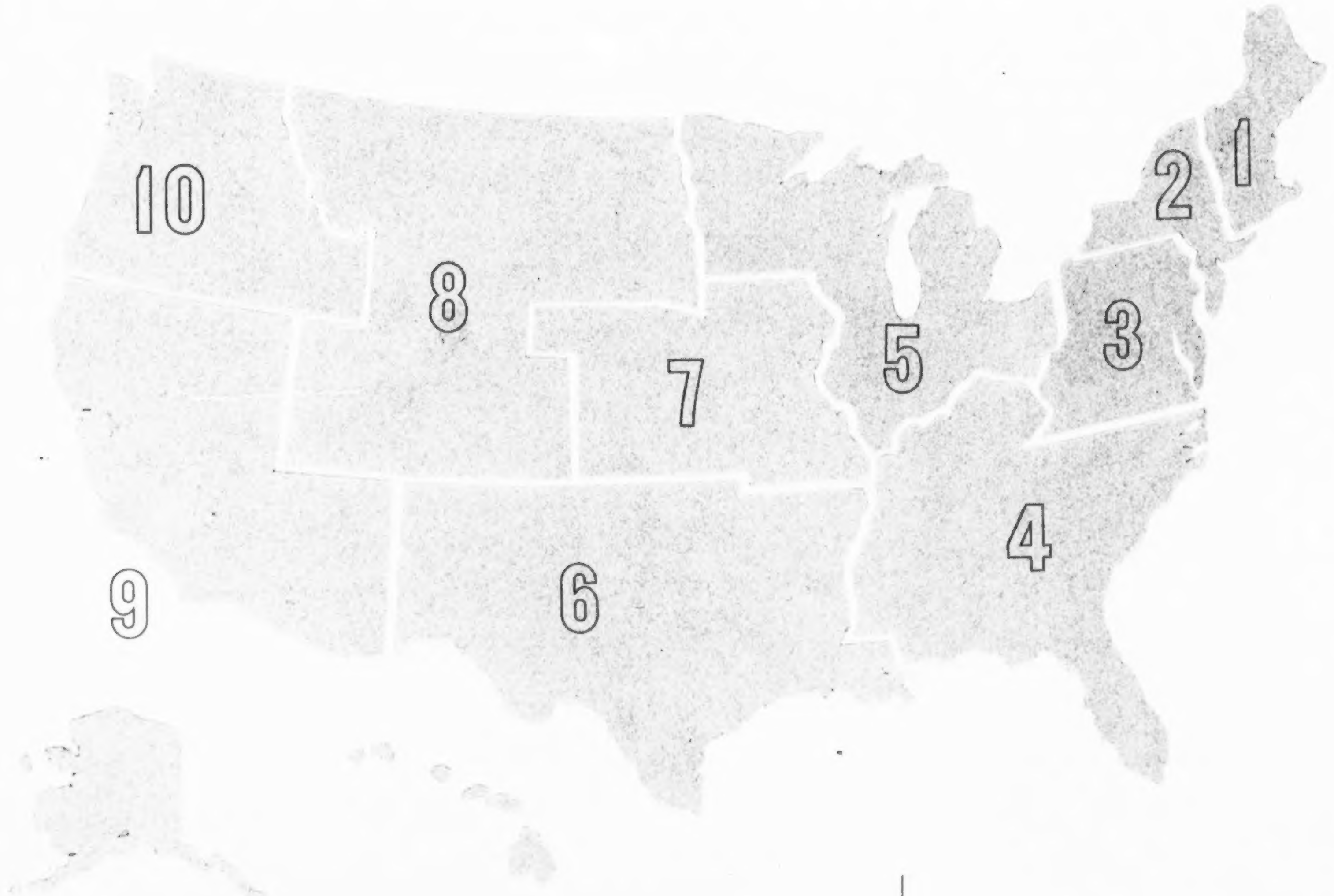
1972 Dates	Course Number	Course Title and Location
May 1-5	413	Control of Particulate Emissions (Redmond, Wash.)
May 1-5	427	Combustion Evaluation (Research Triangle Park, N.C.)
May 8-12	415	Control of Gaseous Emissions (Redmond, Wash.)
May 8-19	426	Statistical Evaluation of Air Pollution Data (2-Weeks, Research Triangle Park, N.C.)
May 8-19	453	Analysis of Atmospheric Pollutants (2-Weeks, for Technicians only, Research Triangle Park, N.C.)
May 8-12	411	Air Pollution Meteorology (Research Triangle Park, N.C.)
May 9-11	439	Visible Emissions Evaluation (Chicago, Illinois)
May 22-26	420	Air Pollution Microscopy (Edison, New Jersey)
May 22-26	450	Source Sampling (Research Triangle Park, N.C.)
May 22-26	423	Diffusion of Air Pollution – Theory and Application (Research Triangle Park, N.C.)
May 30-June 17	452	Principles and Practice of Air Pollution Control (Basic 3-Week course, Research Triangle Park, N.C.)
June 5-9	448	Air Pollution Effects on Vegetation (Research Triangle Park, N.C.)
June 5-9	427	Combustion Evaluation (Edison, New Jersey)
June 5-16	436	Determination and Measurement of Atmospheric Metals (2-Weeks, Research Triangle Park, N.C.)
June 6-8	439	Visible Emissions Evaluation (Research Triangle Park, N.C.)
June 12-23	426	Statistical Evaluation of Air Pollution Data (2-Weeks, Austin, Texas)
June 19-23	413	Control of Particulate Emissions (San Francisco, California)
June 19-30	436	Determination and Measurement of Atmospheric Metals (2-Weeks, Research Triangle Park, N.C.)
June 26-30	447	Meteorological Instrumentation in Air Pollution (Research Triangle Park, N.C.)
June 26-30	415	Control of Gaseous Emissions (San Francisco, California)
June 26-30	427	Combustion Evaluation (Denver, Colorado)

● Courses 408, 409, and 429 emphasize laboratory determinations relating to air quality standards.

● Course 453 for Technicians only.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REGIONAL DIRECTORS OF THE ENVIRONMENTAL PROTECTION AGENCY'S AIR POLLUTION CONTROL PROGRAMS

1

Region One
Connecticut, Maine,
Massachusetts, New Hampshire,
Rhode Island, Vermont
Attn: Mario Storlazzi
John F. Kennedy Federal Building
Boston, Massachusetts 02203
Telephone: (617) 223-6883
or 223-6339

2

Region Two
New York, New Jersey,
Puerto Rico, Virgin Islands
Attn: Kenneth L. Johnson
Federal Office Building
26 Federal Plaza (Foley Square)
New York, New York 10007
Telephone: (212) 264-2517

3

Region Three
Delaware, District of Columbia,
Maryland, Pennsylvania,
Virginia, West Virginia
Attn: Stephen C. Wassersug
401 North Broad Street
Philadelphia, Pennsylvania 19108
Telephone: (215) 597-9154

4

Region Four
Alabama, Florida, Georgia,
Kentucky, Mississippi,
North Carolina, South Carolina,
Tennessee
Attn: Gene B. Welsh
50 Seventh Street, North East
Room 404
Atlanta, Georgia 30323
Telephone: (404) 526-3043

5

Region Five
Illinois, Indiana, Minnesota,
Ohio, Michigan, Wisconsin
Attn: Ronald J. Van Mersbergen
New Post Office Building
Room 712
433 West Van Buren Street
Chicago, Illinois 60607
Telephone: (312) 353-6942

6

Region Six
Arkansas, Louisiana,
New Mexico, Oklahoma, Texas
Attn: Dean Mathews
1114 Commerce Street
Room 1414
Dallas, Texas 75202
Telephone: (214) 749-3989
or 749-3980

7

Region Seven
Iowa, Kansas, Missouri,
Nebraska
Attn: Dewayne E. Durst
601 East 12th Street
Kansas City, Missouri 64106
Telephone: (816) 374-3791

8

Region Eight
Colorado, Montana,
North Dakota, Utah, South Dakota,
Wyoming
Attn: Earl V. Porter
Federal Office Building
Room 9017
Denver, Colorado 80202
Telephone: (303) 837-4682

9

Region Nine
Arizona, California,
Hawaii, Nevada
Attn: David L. Calkins
Federal Office Building
50 Fulton Street
San Francisco, California 94102
Telephone: (415) 556-1105

10

Region Ten
Alaska, Idaho,
Oregon, Washington
Attn: Leonard A. Miller
Arcade Plaza
1321 Second Avenue
Seattle, Washington 98101
Telephone: (206) 442-0522

GENERAL I
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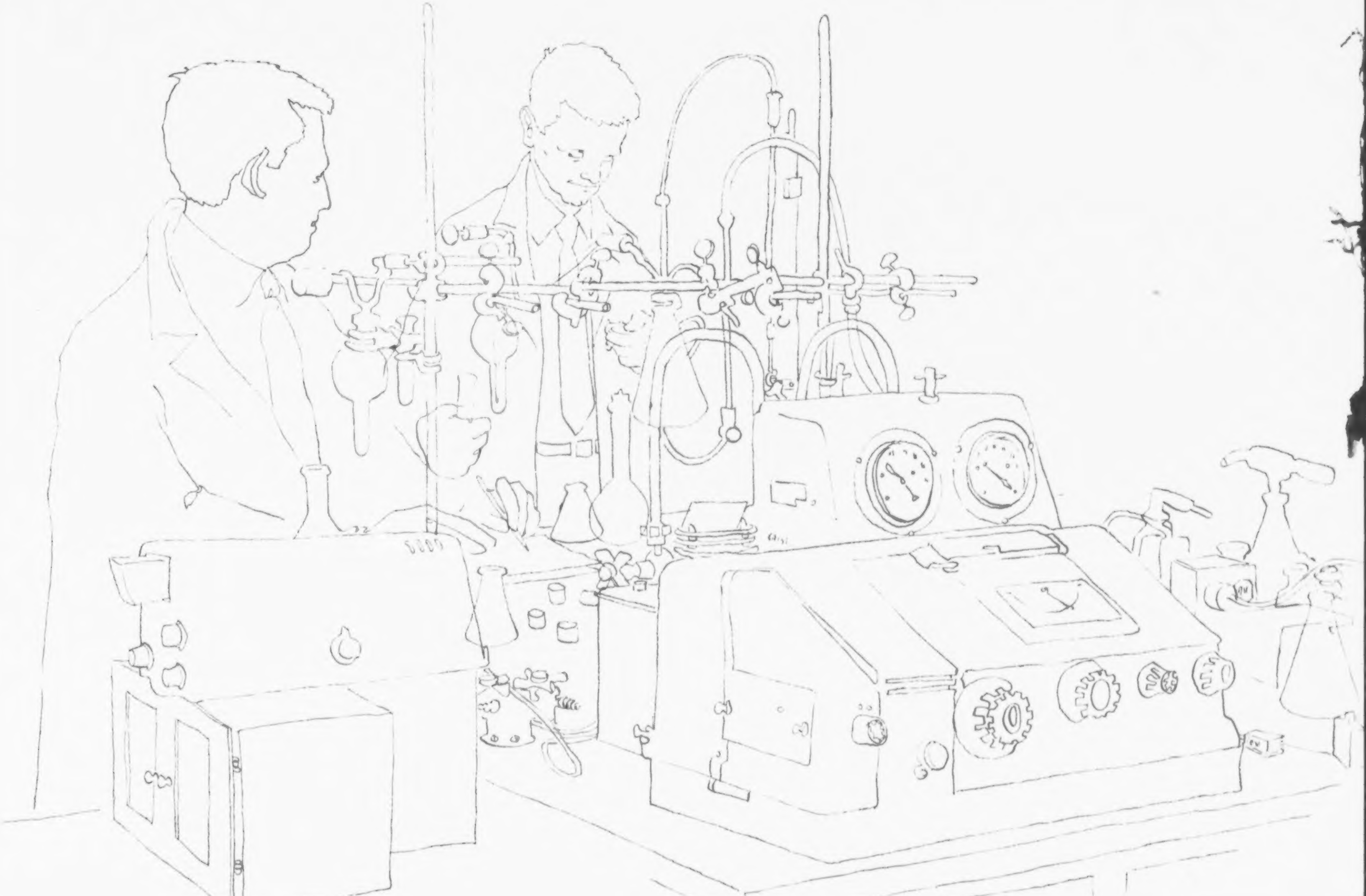
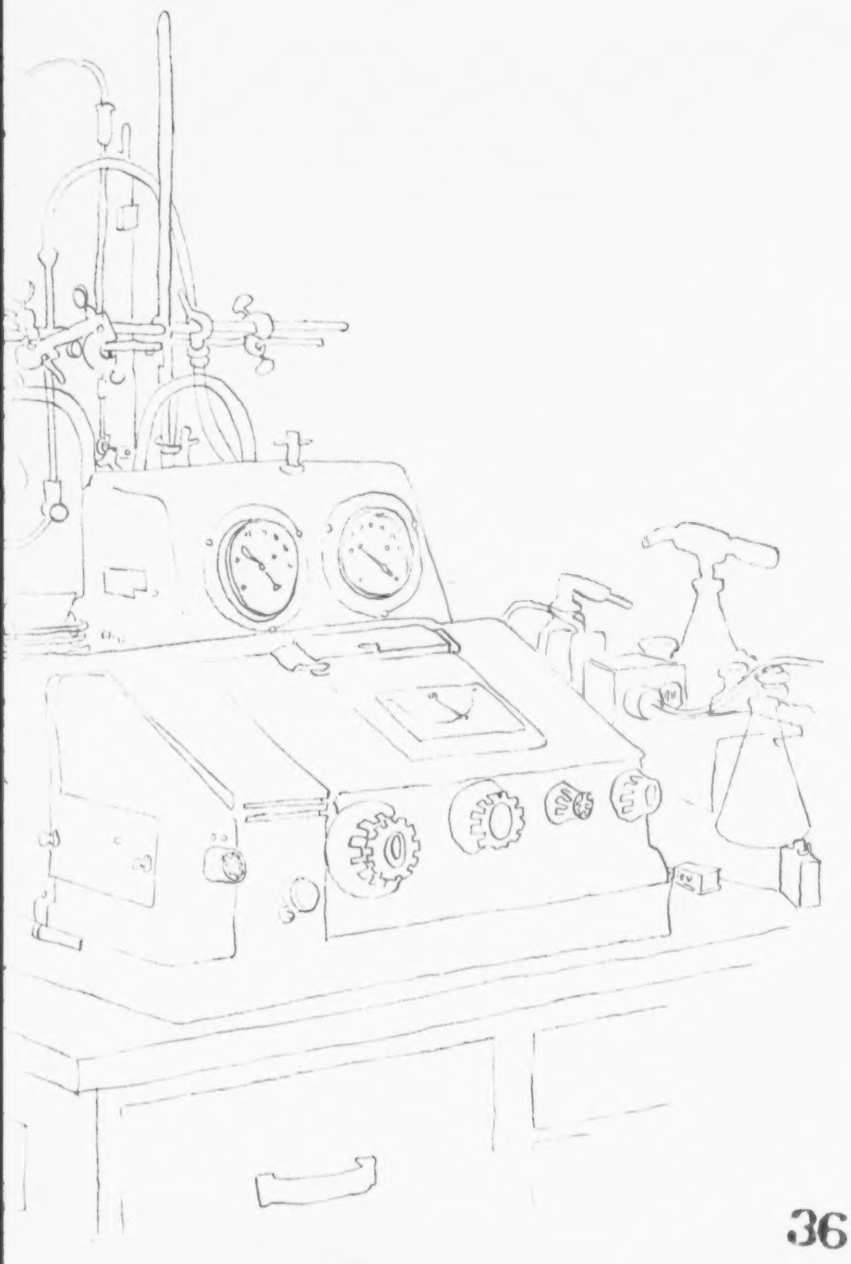


GENERAL INFORMATION
FOR AIR POLLUTION TRAINING

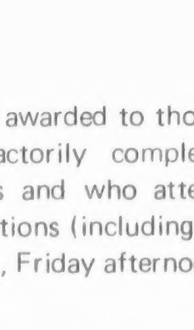


Eligibility Requirements

An acceptance committee within the Office of Manpower Development evaluates course applications forwarded to the Institute for Air Pollution Training and notifies applicants whether they meet the qualification requirements for the course or courses selected. An important consideration in evaluating eligibility is the applicant's background, experience in air pollution control, and potential for career development. The broad spectrum of courses offered by the Institute ranges from basic training designed for personnel with little or no experience to highly specialized learning modes designed to meet the needs of more sophisticated air pollution control personnel. Many courses require completion of written tests and/or study assignments by the applicant prior to course attendance.

Registration

No tuition or registration fee is charged for the courses presented by the Institute. Since the size of classes is limited, applications should be forwarded as early as possible. Trainees are expected to provide for their own housing, meals, and transportation while attending courses. To provide training service to a maximum number of organizations the number of applicants from a single agency for any one course necessarily may be limited. To apply for admission to the courses presented by the Institute complete one of the application blanks inserted in this bulletin on pp. 100-108. A separate application form is required for each course.



Certificates

Certificates will be awarded to those students who satisfactorily complete all course assignments and who attend all scheduled presentations (including where applicable: evening, Friday afternoon and Saturday sessions).

Training Faculty

A full-time staff of specialists, as well as a number of adjunct faculty members, plan, develop, and conduct the courses. Lecturers and consultants who can contribute significantly from their specific knowledge and experience are drawn from Office of Air Programs personnel, other Federal, state and local agencies, universities, and industry.

Training Objectives

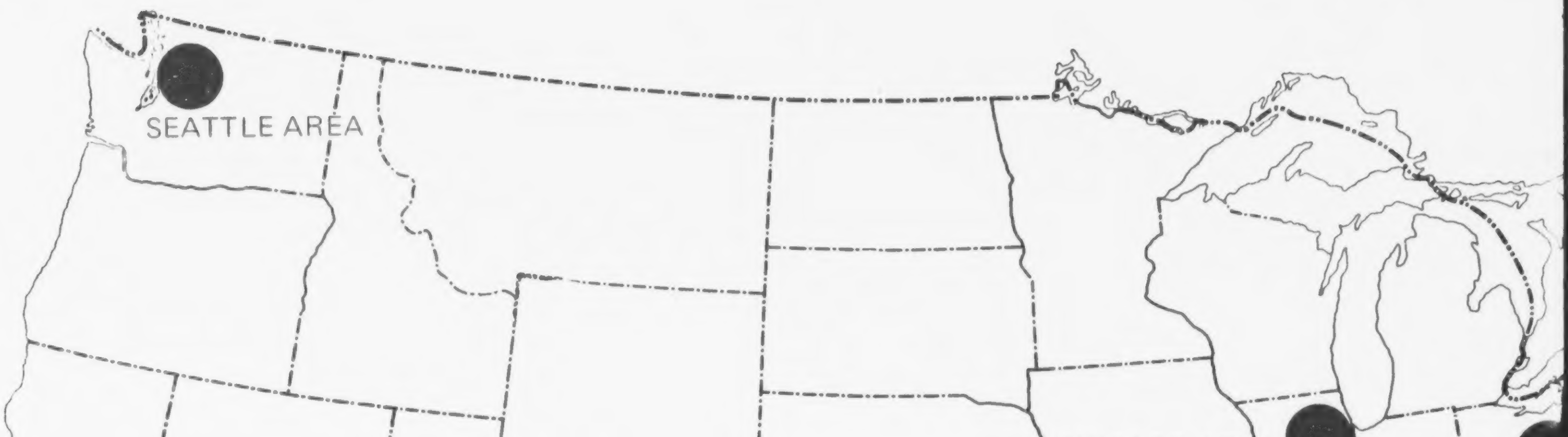
The Office of Manpower Development and the Institute for Air Pollution Training offer a variety of short-term technical courses in the field of air pollution control for scientists, engineers and other professional personnel assigned responsibility in this area of environmental concern. Effective means for detailed consideration and appraisal of the newest developments in specific areas are provided, together with an opportunity for practice in the use and application of current control techniques. Visual aids, closed-circuit television, laboratory demonstrations, problem sessions and panel discussions are programmed into course presentations. Laboratory and field practice under the guidance of experts is included in the course agenda where applicable. Active participation by each trainee is mandatory.

Technical Courses

Highly specialized, technical courses of from one to several weeks duration are conducted in the fully equipped classrooms of the Institute for Air Pollution Training, and at a number of locations throughout the country. Technical courses, usually at the postgraduate level, provide intensive training in the basic elements and methodology of air pollution control plus an opportunity for laboratory practice. In addition, several broad-coverage courses are offered for those in technical administrative positions who wish to acquire an overall perspective in specific scientific areas. Agenda for all courses are available upon request in advance of course presentations.

Technical Seminars

The Office of Manpower Development and the staff of the Institute for Air Pollution Training upon request will, counsel and participate in planning the presentation of technical seminars and workshops designed to meet specific needs. Symposia which provide a forum for the exchange of ideas and information, are also supported. These meetings bring together experts from throughout the United States and the world. Announcement of many such seminars, workshops, and symposia is made by publication in scientific journals. Attendance at others is restricted to an individually invited audience.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SAN FRANCISCO AREA
DENVER AREA
CHICAGO AREA
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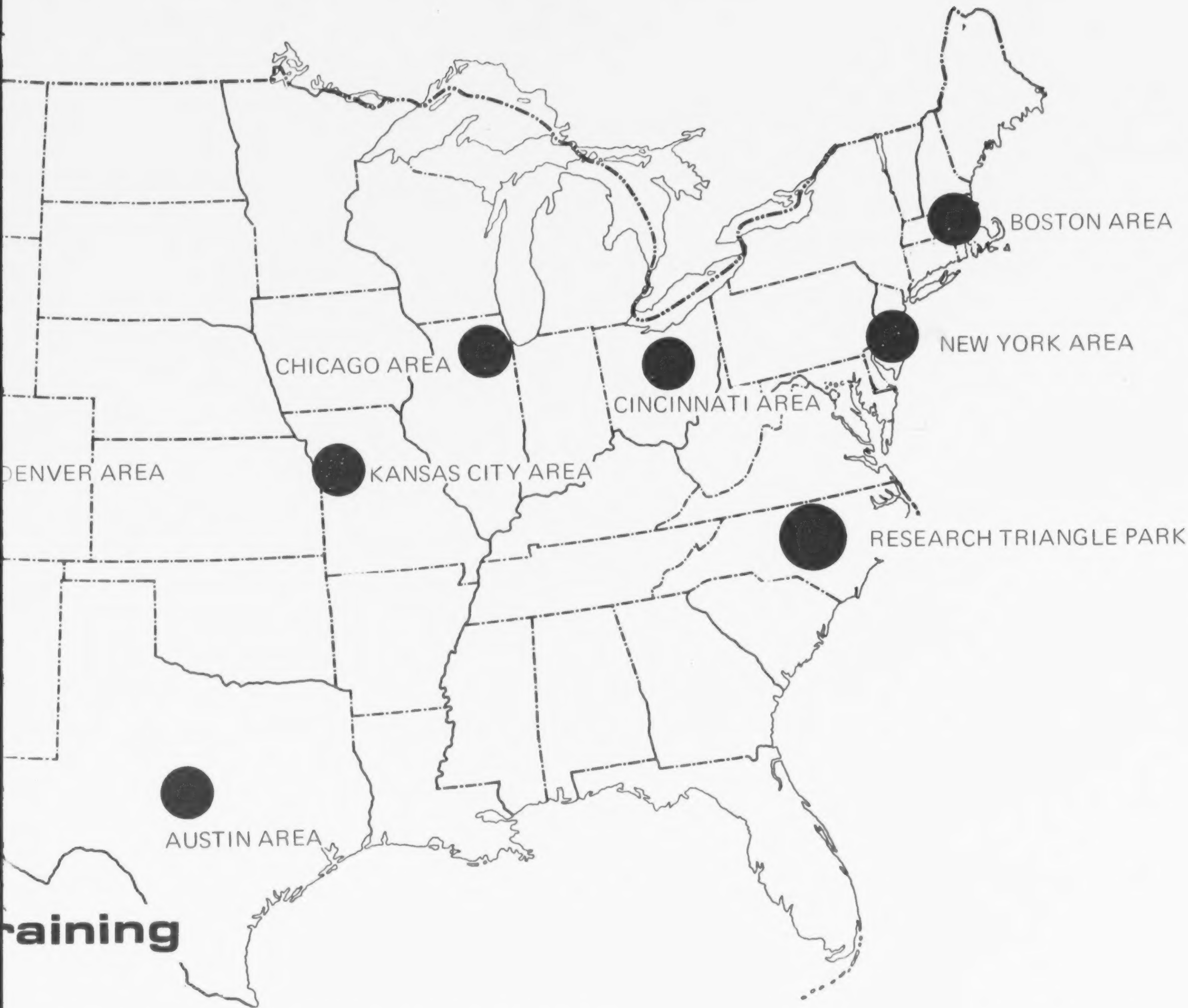
AUSTIN AREA

Institute for Air Pollution Training Locations

1971-72 courses offered by the Institute for Air Pollution Training will be presented at Research Triangle Park, North Carolina and the 9 training locations pictured above.

——————→ Applications for all training courses must be sent to the Registrar, Institute for Air Pollution Training, Research Triangle Park, North Carolina 27711

Field and resident course schedules appear on pages 44-47. Application forms are provided on pages (100-108).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CINCINNATI AREA
DENVER AREA
KANSAS CITY AREA
RESEARCH TRIANGLE PARK
AUSTIN AREA

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Pollution Training will be presented at Research Triangle Park,
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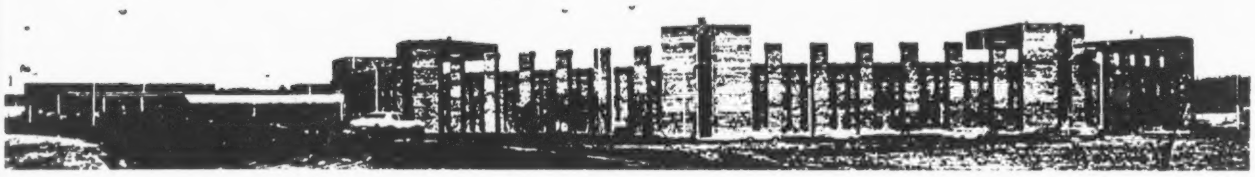
Triangle Park, North Carolina 27711
ages 44-47. Application forms are provided on pages (100-108).

INSTITUTE FOR AIR POLLUTION TRAINING



Eligibility Requirements

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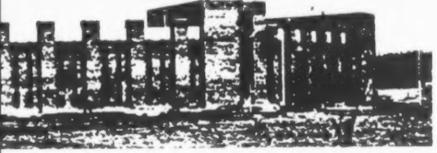

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COURSE DESCRIPTIONS

Certificates will be awarded to those students
who satisfactorily complete all
course assignments and who attend all scheduled presentations
(including where applicable; evening
Friday afternoon and Saturday sessions).

ORIENTATION COURSES

422·A

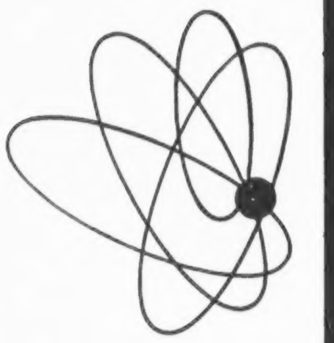
Packaged Orientation Course

To meet diverse training needs, the Office of Air Programs of the Environmental Protection Agency has developed a tiered system of instructional programs.

The first tier consists of orientation courses. One of these courses, 422–A, consists of a series of units (multiple learning packages) developed specifically for people with no previous training in air pollution control. Course content is similar to that included in the superseded course 422.

This new course, similar to others in the orientation series, is developed in an individualized instruction mode and includes cassette-taped lectures with student workbooks and accompanying visuals.

The course is designed to function "off-the-shelf" for use by all air pollution control agencies. New employees no longer need wait for an opening in an assembled course. Training is available to them the first day on the job, at the job.



422·B

CAI Course
(Computer-Assisted Inst

This course is a computer-assisted instructional package available for use by agencies that possess or have access to computer terminals. The following segments make up the course: introduction, legal aspects, meteorology, sources, effects, pollutants, introduction to control, and technology of control.

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422·

Specialized Subje
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Additional subject areas are also available upon request in the same packaged format as 422–A.

These packages provide orientation in special areas of air pollution control not generally covered in the initial orientation course 422–A and 422–B. Special areas covered include:

- Visible emissions
- Air pollution effects on vegetation
- Air pollution effects on man's respiratory system

Additional packages will be added on a continuing basis.

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422·B

CAI Course
(Computer-Assisted Instruction)

This course is a computer-assisted instructional package available for use by agencies that possess or have access to computer terminals. The following segments make up the course: introduction, legal aspects, meteorology, sources, effects, pollutants, introduction to control, and technology of control.

Both 422–A and 422–B will provide a broad introduction to air pollution control. They are complementary to one another in content. As such, agencies with computer terminals will be able to use both courses; those without terminals will still have inhouse orientation training capability.

422·C

Specialized Subjects
(Multiple learning packages)

Additional subject areas are also available upon request in the same packaged format as 422–A.

These packages provide orientation in special areas of air pollution control not generally covered in the initial orientation course 422–A and 422–B. Special areas covered include:

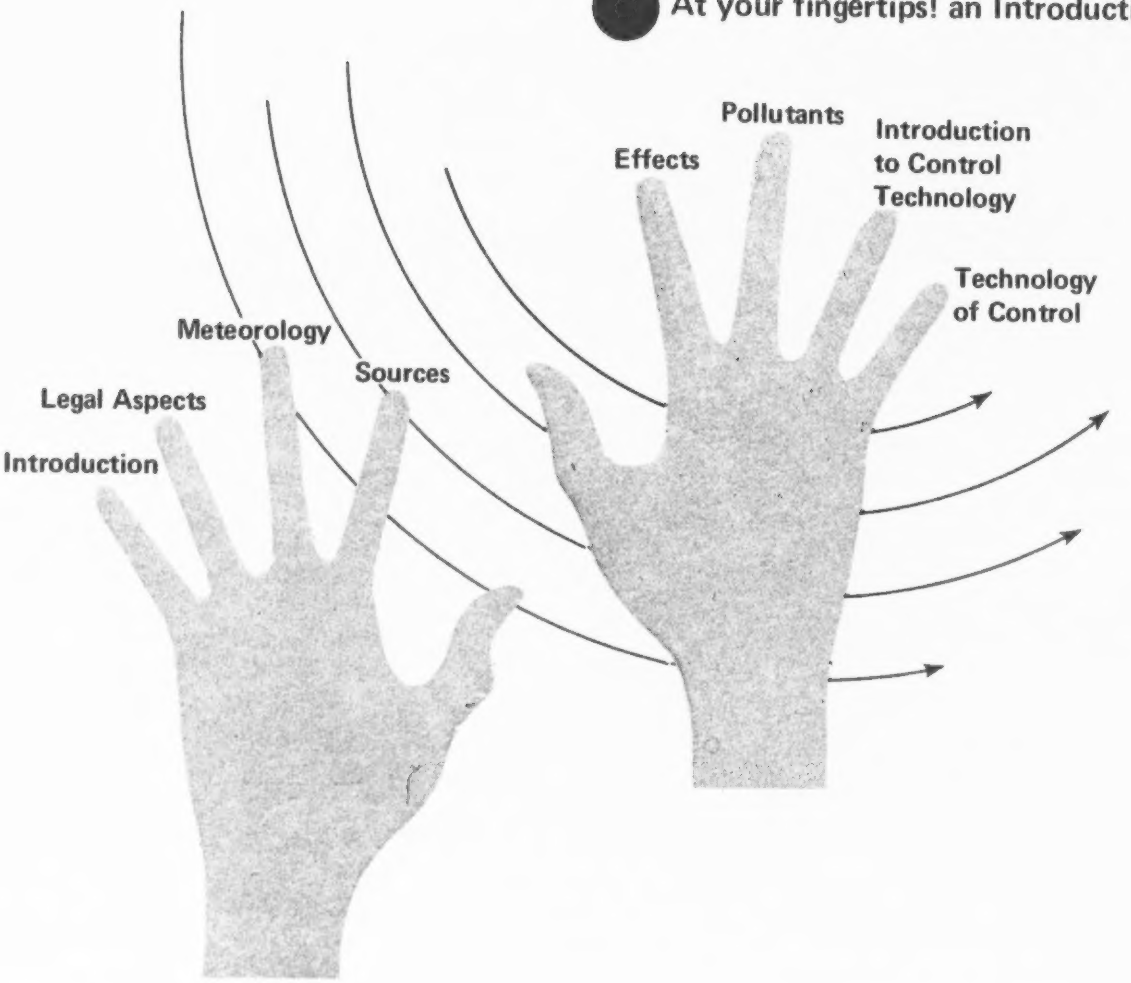
Visible emissions
Air pollution effects on vegetation
Air pollution effects
on man's respiratory system

Additional packages will be added on a continuing basis.

The broad content of the orientation courses makes them particularly useful for all new local, State and Federal air pollution control agency employees. Additionally, schools can use the materials in their rapidly growing environmental education programs, and industry can use the materials to introduce key employees to the needs and background problems encountered in the study of air pollution control.

For additional information, write to:
Office of Manpower Development
Institute for Air Pollution Training
Post Office Box 12055
Research Triangle Park, North Carolina 27709

● At your fingertips! an Introduction plus Seven B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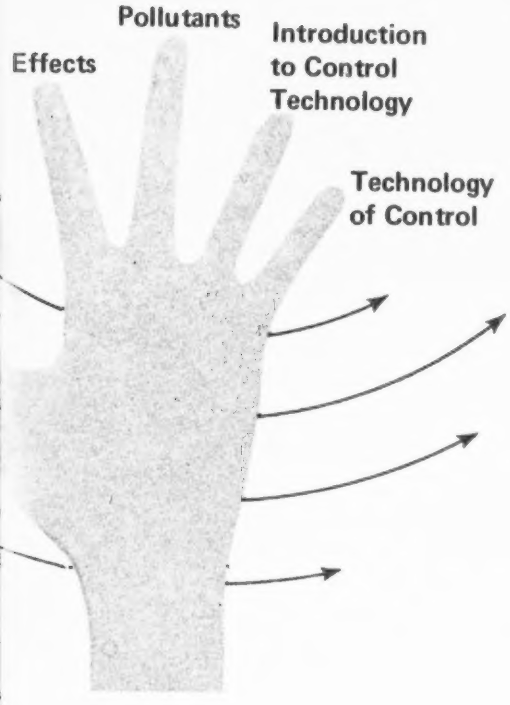
At your fingertips! an Introduction plus Seven Basic Air Pollution Topics


Effects
Pollutants
Introduction to Control Technology
Technology of Control

CAI
Computer-Assisted Instruction

The Office of Air Programs of the Environmental Protection Agency has developed and is continuing to develop computer-assisted courses. Such courses provide ready opportunity for new, inexperienced employees of air pollution control agencies at all levels to familiarize themselves with control concepts, terminology and activities. It is hoped that these same courses will help fill an immediate and rapidly expanding need in educational institutions for good environmental protection educational materials.

Computer-Assisted Instruction (CAI) is a learner mode that overcomes many of the traditional difficulties associated with the classroom lecture mode of instruction – shortage of trained staff, scheduling, inconsistent quality. A CAI course, programmed and electronically stored in computer centers, can reach an infinite number of people in technical schools, universities, industry, and government wherever computer terminals are located. It may be taken from any number of terminals simultaneously; the only limitation is the number of terminals available.

Despite the mass educational potential of CAI, each course is designed in a tutorial mode to utilize dialogue and drill practice techniques commonly associated only with small classes and a teacher. To take a course, the student merely dials a telephone number to connect his terminal to the computer center servicing his institution. He can begin at any time; and, if he wants to break away during the course, the computer will "keep his place" for an indefinite period of time until he is ready to continue.

CAI will play a significant role in OAP's manpower training program. As more state and local air pollution control agencies install computer terminals, fewer employees will be forced to leave their job locations to take certain needed OAP training courses. Universities, most of which have computer facilities, will easily be able to supplement their curricula with CAI training courses provided by the Office of Air Programs.

The first course (an orientation course) developed in the CAI mode, Introduction to Air Pollution is operative.

The course begins with a brief introduction, intended primarily to familiarize the student with the computer format. Having completed this, the student continues with one of the following topics: legal aspects, meteorology, sources, effects, pollutants, introduction to control, and technology of control. Because each topic is an independent unit, the student may take as many as he needs in whatever sequence he prefers. Each of the topics is described on these pages.

Introduction

The air pollution problem is placed in historical perspective in this introductory section. The student learns about the various types of air pollution and the effects of pollution on man, materials, and vegetation. Several disasters attributed to air pollution during this century and some of the controversial questions pertaining to air pollution control are covered. Upon completion of this section the student will be able to:

> Give examples of natural and man-made pollutants. Describe (citing cause/effect relationships) the following disasters: Meuse Valley, Belgium; Donora, Pennsylvania; Poza Rica, Mexico: London, and New York City. Discuss opposing viewpoints on such questions as tolerable levels of pollution, delegation of responsibility to appropriate levels of government, and planning and implementing effective control strategies.

Pollutants

After learning the composition of "clean" air, the student learns the terms used for describing atmospheric concentrations of gaseous and suspended particulate pollutants. He then learns the methods employed for classifying pollutants and how to describe the formation of pollutants in the atmosphere by photochemical reactions. At the conclusion of this learning session the student will be able to:

> Identify the components of clean air. List the pollutants commonly found in an urban atmosphere

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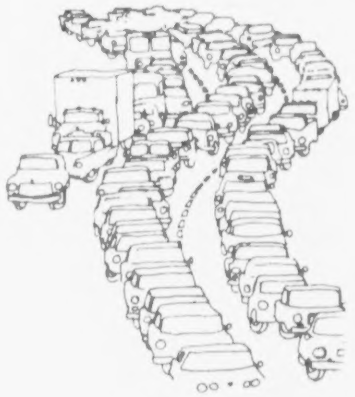
Identify the components of clean air. List the pollutants commonly found in an urban atmosphere and estimate the approximate range of concentrations normally encountered. Give several examples of methods used for classification of pollutants. List the essential components in atmospheric photochemical reactions.



Sources

To plan effective air pollution control strategies, the student must be able to identify the source or sources of various pollutants. In this section the student learns the basic elements of efficient combustion as well as the distinguishing characteristics of process loss sources. He also learns methods of classifying air pollution sources. In addition he will study the major sources of primary pollutants (sulfur oxides, nitrogen oxides, carbon monoxides, hydrocarbons, and particulates). At the conclusion of this learning unit the student will be able to:

Define combustion and list the products of "ideal," "non-ideal," and "incomplete" combustion. Given descriptions of industrial plants, identify the types and relative amounts of pollutants emitted. List the major sources of primary pollutants.

Effects

The section on Effects of Air Pollution is divided into three parts: (1) effects on health, (2) effects on vegetation, and (3) effects on materials and visibility. The student must first learn how to determine a valid relationship between cause and effect; this relationship must be established before he can attribute observable damage to air pollution.

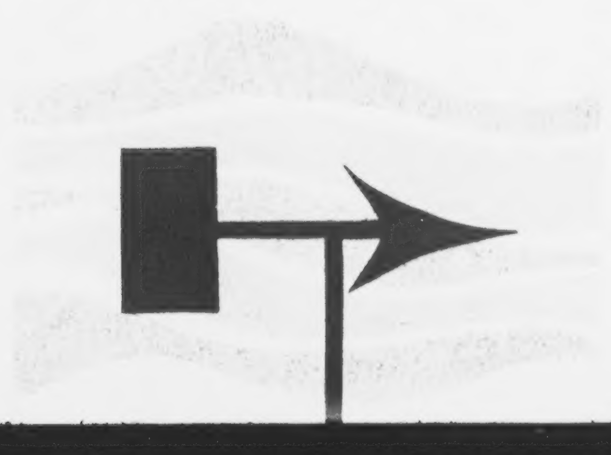
The student briefly reviews man's respiratory system preparatory to learning which areas of the system are affected by different concentrations of gases and varying sizes of particles. He then learns the typical physiological responses to inhaled pollutants and how to identify them. After being introduced to the concept of total body burden, he learns to identify the effects of certain pollutants on various areas of the body.

In the effects on vegetation section, the student reviews leaf structure and the basic functions of various plant parts. Next, he studies the types of pollutants that damage plants, the specific plants susceptible to damage, and the symptoms of damage attributable to various pollutants.

In the third segment the student studies air pollution effects on materials (by associating materials subject to atmospheric deterioration with pollutants responsible for damage) and by learning the variety of mechanisms of air pollution damage (chemical attack, abrasion, soiling).

Upon completion of this section the student will be able to:

> Recognize a valid cause/effect relationship. State what chemical irritants are suspected of causing respiratory diseases, what diseases are attributed in part to pollutants, and what disorders are aggravated by certain levels of pollution. Identify gaseous pollutant effects on plants, list specific harmful pollutants, and recognize symptoms of the damage caused. List pollutants that damage materials and describe their effects.



Meteorology

In this section the student is introduced to meteorological terminology and to atmospheric conditions important to air pollution studies. The student learns the roles of several meteorological factors in the dispersion of atmospheric pollutants and the influence of weather on the cyclical variations in air quality. Mechanisms for natural cleansing of the atmosphere are presented, together with the effect of air temperature and humidity on air pollution levels and visibility. At the conclusion of this section the student will be able to:

> Describe the major effects of surface influence and the influence of topography on wind and extract useful information from a wind rose. Relate temperature lapse rate to atmospheric stability and associate six plume types, (looping, coning, fanning, fumigation, trapping, and lofting) with the appropriate environmental temperature profile. Discuss the influence of meteorological factors on air pollution levels (e.g., temperature inversion, land and sea breeze, and thermal versus mechanical turbulence).

Introduction to Control Technology

In this basic control technology section, the characteristics and determining factors of atmosphere areas and urban areas are described, the advantages of a regional approach to air pollution control are outlined. These are all placed within the context of current Federal laws governing air pollution control. This instruction will enable the student to:

> Describe atmospheric areas and urban areas. De-

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ral laws governing air pollution control. This
n will enable the student to:

e atmospheric areas and urban areas. Describe the need for the establishment of air quality criteria and standards and state how standards are set.

Technology of Control

In this section the student learns the principles of maximizing the dilution capacity of the atmosphere and of minimizing the generation of pollutants through the use of raw materials and fuels with low air pollution potential, the proper design of process and combustion equipment, and the careful operation and maintenance of plant equipment. A survey of control equipment (designed to remove pollutants) is made, and the student is cautioned to the relationship between air pollution control and the control of other forms of environmental pollution before selecting control methods and equipment. At the completion of this section the student will be able to:

> Differentiate between physical and effective stack heights. Given a description of an industrial plant, select appropriate air pollution control methods and equipment. Discuss three ways of minimizing the generation of pollutants.

Legal Aspects

The abatement of air pollution frequently requires legal action involving government officials, industry representatives, and the public. This section of the course introduces the student to the fundamental concepts of law and describes Federal statutes governing the air pollution control program. Upon completion of this section the student will be able to:

> Define common law and statutory law and discuss the relative merits of each in terms of pollution abatement. List enactment dates of significant Federal laws governing air pollution and describe the major provisions of each, such as delegation of responsibility for control to the states, designation of air quality regions, grants to agencies, and approved research areas. Given a description of an air pollution problem, state what levels of government have jurisdiction over the matter and what legal steps are available to enforcers of Federal and state laws.

BASIC COURSE

3-Week Comprehensive Course in Air Pollution Control Technology

Principles an

The responsibility of the Federal Governmen
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in the recruitment and development of qua
sonnel is a major theme of the 1970 Clean Ai

To meet these growing manpower needs,
room, laboratory, and field training are combi
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This basic three-week course provides a c
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tion control. The student receives classroom t
in the principles and practice of identificat
sources, effects, pollution control technolog
bases for control, meteorology, and program a
stration. Additional classroom training and lab
practice develop basic skills related to sa
plume evaluation, laboratory analyses, field s
and data evaluation.

Emphasis is placed upon group interaction t
participation in workshops, seminars and probl
sions. The trainees assume a variety of roles
computer-based simulation exercise APEX (Ai
tion Exercise). Substantial participation in lab

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Principles and Practice of Air Pollution Control
3 Weeks

The responsibility of the Federal Government's Office of Air Programs to provide leadership and assistance to State and local air pollution control agencies in the recruitment and development of qualified personnel is a major theme of the 1970 Clean Air Act.

To meet these growing manpower needs, classroom, laboratory, and field training are combined in this intensive three-week course in air pollution control conducted by the Institute for Air Pollution Training.

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This basic three-week course provides a comprehensive introduction to the technology of air pollution control. The student receives classroom training in the principles and practice of identification of sources, effects, pollution control technology, legal bases for control, meteorology, and program administration. Additional classroom training and laboratory practice develop basic skills related to sampling, plume evaluation, laboratory analyses, field studies, and data evaluation.

Emphasis is placed upon group interaction through participation in workshops, seminars and problem sessions. The trainees assume a variety of roles in the computer-based simulation exercise APEX (Air Pollution Exercise). Substantial participation in laboratory practice is included. Major topics include:

Management Services
Air quality standards and criteria
Administration
Public information and community relations
Development of control strategies
Analyses of sources and effects

Technical Services
Laboratory operations
Operation of monitoring networks
Data reduction and processing
Selected analytical methods
Meteorology

Field Services (Enforcement)
Scheduled inspections
Complaint handling and investigations
Operation of field patrols
Preparation for legal actions
Emergency episode procedures
Source identification and registration

Engineering Services
Calculation of emission estimates
Operation of permit systems
Source testing
Source control regulations
Control of particulates
Control of gases

Students participating in Apex games at Research Triangle Park facilities.

APEX

(Air Pollution Exercise)

Simulation Exercises

The responsibility of the Federal Government's Office of Air Programs to provide leadership and assistance to State and local air pollution control agencies in the recruitment and development of qualified personnel is a major theme of the 1970 Clean Air Act. The Office of Air Programs, (OAP) in conjunction with the University of Southern California and the University of Michigan, has created and developed a simulation exercise identified as APEX (Air Pollution Exercise). This exercise establishes a dynamic atmosphere in which the trainees participate in a "real world" simulation involving a community with urban and rural problems, industrial activities, and a variety

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Students participating in Apex games at Research Triangle Park facilities.

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ce to State and local air pollution control agencies
he recruitment and development of qualified per-
nel is a major theme of the 1970 Clean Air Act.
Office of Air Programs, (OAP) in conjunction
the University of Southern California and the
versity of Michigan, has created and developed a
ulation exercise identified as APEX (Air Pollution
rcise). This exercise establishes a dynamic atmo-
ere in which the trainees participate in a "real
ld" simulation involving a community with urban
rural problems, industrial activities, and a variety
of air pollution control problems.

Current and projected uses of APEX have been developed through several of the University Consortia established in conjuction with OAP's Office of Manpower Development.

The use of simulation exercises for the training of air pollution control professionals offers two immediate and vital benefits:

1. A means is provided for a working application of theoretical knowledge; the learner applies information and skills to "real life" situations. In addition, motivation directed toward additional learn-

ing results from participation in seeking solutions to the problems.

2. The focus is provided for solving problems through an interdisciplinary approach, where the interrelationship between "formal" areas of study and application becomes evident.

Students participating in APEX assume the roles of a number of decision makers: city and county politicians, city and county planners, developers, industrialists, air pollution control officers, and concerned citizens. Realistic data are supplied for each role, and the students are required to make decisions that are then analyzed by the computer. Next, the results of the decisions are presented as new situational data representing a year of "actual time." Students participating in these programs – which place special emphasis on air pollution problems – employ a wide range of skills and knowledge in a variety of areas. Additional opportunities for growth are provided through seminars, lectures, texts, and working contact with recognized authorities in a number of professions.

Within the overall format of the simulation exercise, emphasis is placed upon specific areas through the use of special situations, for example, hearings on air pollution standards or legal actions brought against a particular industry.

Additionally, preparations are underway to introduce APEX as a graduate course at OAP's new Technical Center in the fall of 1971 for students from the Triangle Universities Consortium. In addition to its use at the University of Southern California, APEX is now being conducted as a graduate course at the University of Illinois at Urbana and at Harvard University as part of an Environmental Education program for both graduate and undergraduate studies.

Prerequisites for Advanced Engineer

Courses 422-A or 422-B,
are prerequisites for cours

Courses 422-A or 422-B –
are prerequisites for cour

Applicants who have com
may forego courses 422-A

Prerequisites for course 4
– or equivalent training
a programmed text in ba
for home study prior to r

Prerequisites for Advanced Surveil

Courses 422-A or 422-B
is a prerequisite for cours

Course 411
is a prerequisite for non-
to register for course 447

Course 411 – or equivale
is a prerequisite for stude
to register for course 42

Course 452 – or equivale
is a prerequisite for cours
429, 436, 438, 447 and 4

seeking solutions

solving problems
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assume the roles
city and county
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officers, and con-
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ions brought against

underway to intro-
at OAP's new Tech-
or students from the
. In addition to its
California, APEX is
duate course at the
and at Harvard Uni-
ntal Education pro-
rgraduate studies.

Prerequisites for Advanced Engineering and Enforcement courses

Courses 422-A or 422-B, or course 431
are prerequisites for courses 413, 415 and 427.

Courses 422-A or 422-B — or equivalent experience —
are prerequisites for courses 439, 444 and 450.

Applicants who have completed course 452
may forego courses 422-A, 422-B, 431, 439 and 444.

Prerequisites for course 426 are Basic college statistics
— or equivalent training. (Enrollees are required to complete
a programmed text in basic statistics
for home study prior to reporting date for course).

Prerequisites for Advanced Surveillance and Laboratory courses

Courses 422-A or 422-B — or equivalent experience —
is a prerequisite for course 435.

Course 411
is a prerequisite for non-meteorologists seeking
to register for course 447.

Course 411 — or equivalent experience —
is a prerequisite for students seeking
to register for course 423.

Course 452 — or equivalent experience —
is a prerequisite for courses 405, 408, 409, 420, 423,
429, 436, 438, 447 and 448.

ADVANCED COURSES

Engineering and Enforcement

413

Control of Particulate Emissions
5 Days

This course is designed for engineers and other tec
nical personnel responsible for evaluating particulat
collection devices. The fundamental mechanisms o
collection (inertial separation, filtration, electrostat
precipitation, etc.) are discussed and the efficiency o
particulate control equipment is evaluated. T
achieve the goals of this course, 30 percent of th
student's time is spent studying and discussing bas
theory. The remaining 70 percent of this course i
devoted to problem sessions which illustrate the prin
ciples involved in particulate collection. With add
tional information (empirical data), the knowle
gained in this course will assist the trainee in co
ducting plan reviews. Topics include:

Particle size technology
Control of coarse particles
Control of fine particles
Industrial applications

4

Sour

This course is directed toward engineers and chemist
who act as leaders of source stack-gas sampling team
The training offers basic information designed t
enable them to make necessary decisions, and, wit
further field experience, to improve their perfo
mance.

Trainees receive a comprehensive source samplin
assignment, requiring them to perform a site pr
survey, sampling train design, site preparation, sourc
testing, and calculation and presentation of the r

413

Control of Particulate Emissions
5 Days

This course is designed for engineers and other technical personnel responsible for evaluating particulate collection devices. The fundamental mechanisms of collection (inertial separation, filtration, electrostatic precipitation, etc.) are discussed and the efficiency of particulate control equipment is evaluated. To achieve the goals of this course, 30 percent of the student's time is spent studying and discussing basic theory. The remaining 70 percent of this course is devoted to problem sessions which illustrate the principles involved in particulate collection. With additional information (empirical data), the knowledge gained in this course will assist the trainee in conducting plan reviews. Topics include:

Particle size technology
Control of coarse particles
Control of fine particles
Industrial applications

415

Control of Gaseous Emissions
5 Days

This course is designed for engineers and other technical personnel responsible for evaluating gaseous pollutant control equipment. At the conclusion of the course, the student will understand the operational characteristics of gaseous control equipment; and be able (when analyzing industrial problems) to select appropriate gaseous pollution control equipment. In addition this course will provide the technical knowledge to assist the trainee in conducting plan reviews of such control equipment. Major topics include:

Adsorption
Absorption
Combustion Control Equipment
Odor Control

● Courses 413 and 415 are now scheduled sequentially in a two-week block.

450

Source Sampling
5 Days

This course is directed toward engineers and chemists who act as leaders of source stack-gas sampling teams. The training offers basic information designed to enable them to make necessary decisions, and, with further field experience, to improve their performance.

Trainees receive a comprehensive source sampling assignment, requiring them to perform a site presurvey, sampling train design, site preparation, source testing, and calculation and presentation of the results. Course topics include:

Basic theory
Source sampling fundamentals
Gas flow measurements
Collection devices and media
Analytical procedures
Design of source sampling trains
Sampling train aids
Considerations at the source
Source sampling monitors

Faculty
Engineering and Enforcement Section of the Institute for Air Pollution Training

William F. Todd,	B.S., Chemistry M.S., Chemical Engineering
John A. Bramblett,	B.S., Engineering M.P.H.S., Environmental Studies
D. James Grove,	B.S., Chemical Engineering M.E., Chemical Engineering
Dennis P. Holzschuh,	Associate of Science Mechanical Engineering Technology
Imants Krese,	B.S., Civil Engineering M.S., Civil Engineering
Michael J. Senew,	B.S., Mechanical Engineering M.S., Industrial Administration
Joseph E. Sickles,	B.S., Chemical Engineering M.S., Chemical Engineering
Walter S. Smith,	B.S., Chemical Engineering

444

Air Pollution Field Enforcement

4 Days

This course is offered to anyone who has the responsibility and authority to enforce air pollution control laws in the field: field inspectors and engineering inspectors who handle citizen complaints, investigate suspected air pollution control law violations; those who make periodic inspection of potential air pollution sources.

At the conclusion of this course, the student should be able to make an investigation in such a manner that his findings will be admissible in a court of law. He will also learn how to conduct himself so that his report and testimony will be admissible in a court of law. Topics include:

Field enforcement administration
Assembly and review of evidence
Permit systems
Odor investigation
Source registration

439

Visible Emissions Eva

3 Days

This course is designed for air pollution control personnel responsible for the establishment and operation of agency-sponsored training schools involved with visible emissions evaluation.

Instruction provides the trainee with an understanding of the comparative devices and techniques used to evaluate visible emissions based upon the Ringelmann Smoke Chart (U.S. Bureau of Mines Information Circular 7718) and equivalent opacity concepts. The student will be familiar with the legal concepts of plume evaluation systems, typical code limitations currently in use, and the methods employed to certify and recertify clients in the practice of

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439

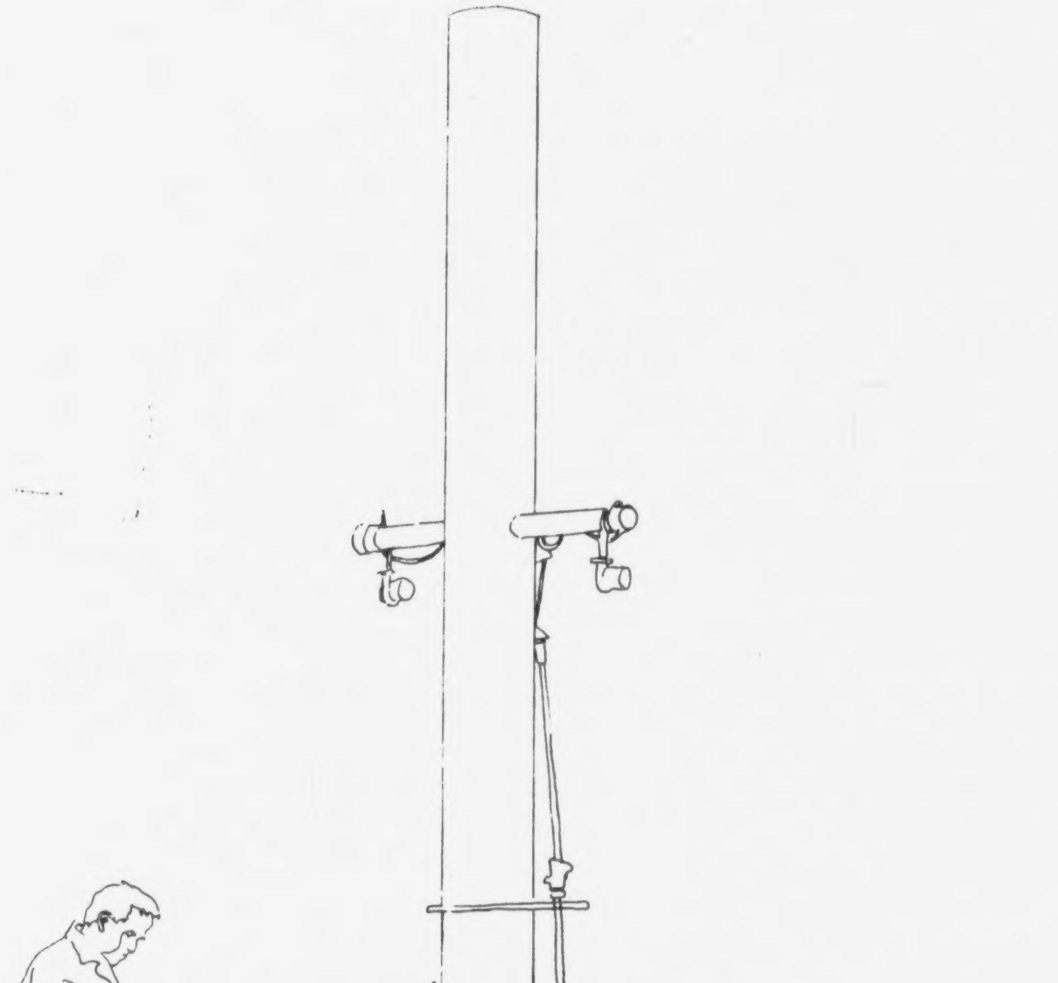
Visible Emissions Evaluation
3 Days

This course is designed for air pollution control personnel responsible for the establishment and operation of agency-sponsored training schools involved with visible emissions evaluation.

Instruction provides the trainee with an understanding of the comparative devices and techniques used to evaluate visible emissions based upon the Ringelmann Smoke Chart (U.S. Bureau of Mines Information Circular 7718) and equivalent opacity concepts. The student will be familiar with the legal concepts of plume evaluation systems, typical code limitations currently in use, and the methods employed to certify and recertify clients in the practice of making visual evaluation of plumes.

The students will also obtain a knowledge of the systems, construction components, maintenance, and operation of equipment used to train emissions evaluation personnel. Agenda items include:

Training techniques, materials, and equipment
Ringelmann and equivalent opacity systems
Plume observations method
Combustion and fossil fuels
Plume generator construction, operations, and maintenance
Legal aspects of visible emissions evaluation



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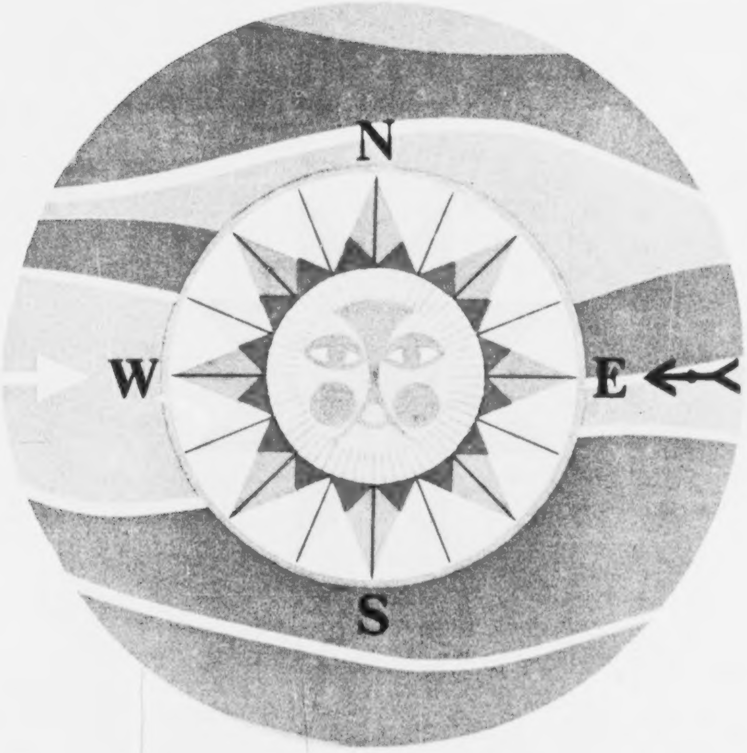
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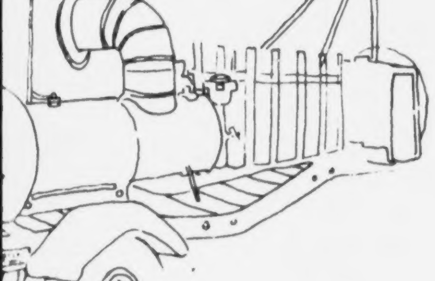

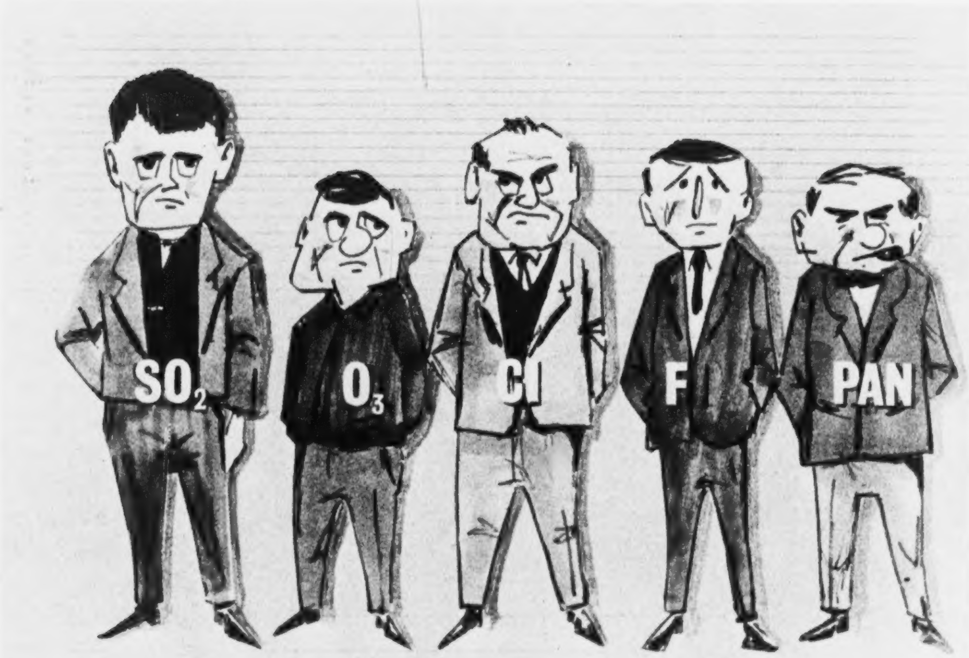
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431

Air Pollution Control Technology
5 Days

The content of this course is designed for technical personnel who make field inspections of sources of air pollution. At the conclusion of the course the students will be familiar with the general operating principles and specific industrial application of the major particulate and gaseous air pollutant control devices. This course does not include a technical analysis of these control devices, and is suggested as a survey course prior to enrollment in courses 413, 415, and 450. Major topics include:

Control of coarse particles
Control of fine particles
Control of gaseous pollutants
Applications of control equipment

441

Special Topics in Engineering and Enforcement
2-5 Days

(By special arrangement upon written request)

The content of this seminar is adjusted to meet the needs of groups in specific geographical locations. Topics for discussion are carefully selected and designed to seek solutions to the problem areas described by the requestors. Arrangements for this special presentation are made through a written request to the appropriate OAP Regional Director.

426

Statistical Evaluation of A
10 Days

Prerequisite: Basic College Statistics or equivalent tr
(enrollees are required to complete a programmed te
for home study prior to reporting date for the cours

This course is designed for professionals responsible for the collection and analysis of air pollution data. It is intended to provide the student with a thorough understanding of the concepts and application of statistics to Air Quality Studies. At the end of this course, the student should be able to apply statistical methods to his work. The lectures and problem sessions are intended to give a thorough knowledge of basic graphic and statistical techniques for reporting air pollution data. The lectures will give the student a working knowledge of statistical methods and de-

42

Combustion E
5 Days

Designed for engineers and other personnel engaged in the evaluation of combustion processes. Specific emphasis is directed toward the air pollution potential of the various combustion processes covered in this course.

At the conclusion of this course the trainees will be familiar with combustion principles and fundamental calculations. Utilizing these principles, the students will be able to evaluate the air pollution potential of fossil-fuel energy sources and waste disposal incinerators.

426

Statistical Evaluation of Air Pollution Data

10 Days

Prerequisite: Basic College Statistics or equivalent training
(enrollees are required to complete a programmed text in basic statistics
for home study prior to reporting date for the course.)

This course is designed for professionals responsible for the collection and analysis of air pollution data. It is intended to provide the student with a thorough understanding of the concepts and application of statistics to Air Quality Studies. At the end of this course, the student should be able to apply statistical methods to his work. The lectures and problem sessions are intended to give a thorough knowledge of basic graphic and statistical techniques for reporting air pollution data. The lectures will give the student a working knowledge of statistical methods and describe some of the advantages and disadvantages of the methods. Major agenda topics include:

- Storage and retrieval of air pollution data
- Principles of data handling
- Basic concepts of sampling
- Experimental design and analysis
- Linear regression
- Time series analysis
- Techniques for analyzing special air pollution data

427

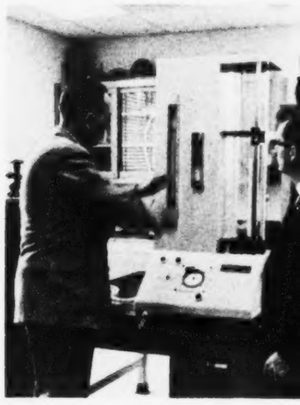
Combustion Evaluation

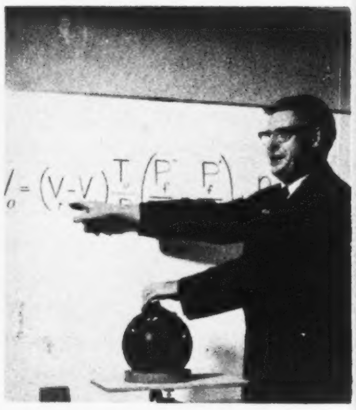
5 Days

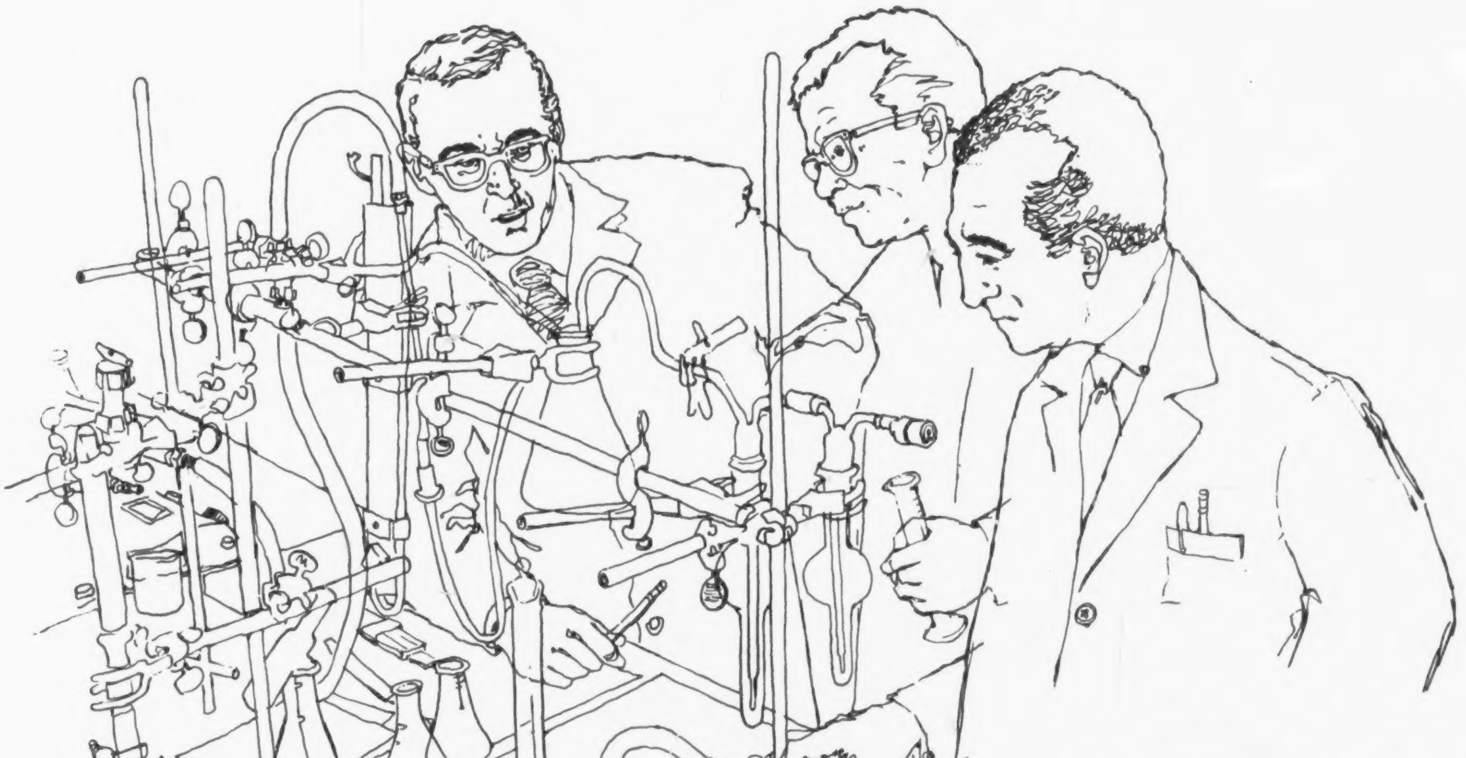
Designed for engineers and other personnel engaged in the evaluation of combustion processes. Specific emphasis is directed toward the air pollution potential of the various combustion processes covered in this course.

At the conclusion of this course the trainees will be familiar with combustion principles and fundamental calculations. Utilizing these principles, the students will be able to evaluate the air pollution potential of fossil-fuel energy sources and waste disposal incinerators. They will also be able to evaluate the operational characteristics of combustion devices designed to reduce the emissions of air pollutants into the atmosphere. Given a criteria, the knowledge gained from the course will assist the trainees in conducting plan reviews. Major topics are:

- Combustion fundamentals
- Fossil-fuel burning
- Burning of solid wastes

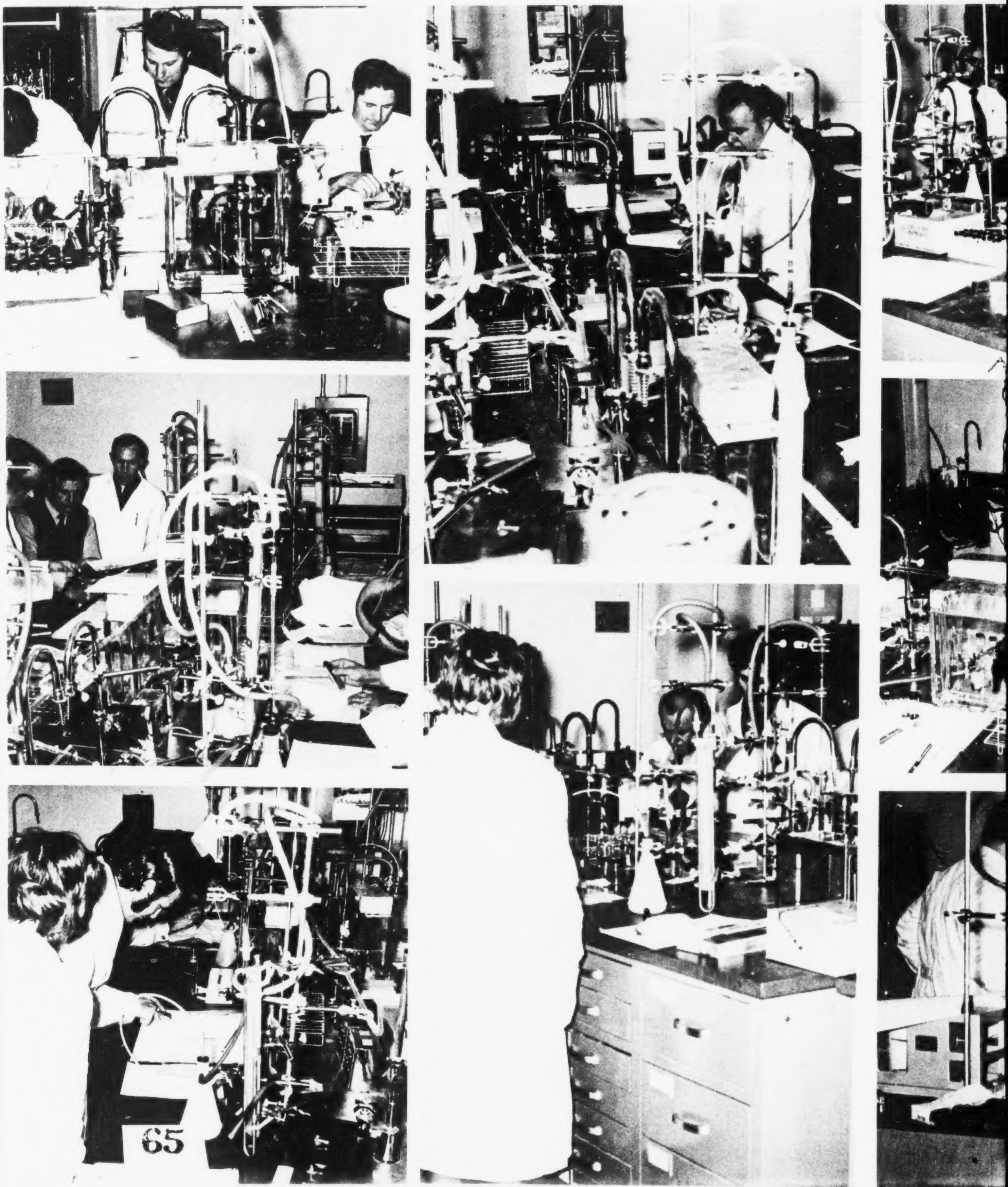


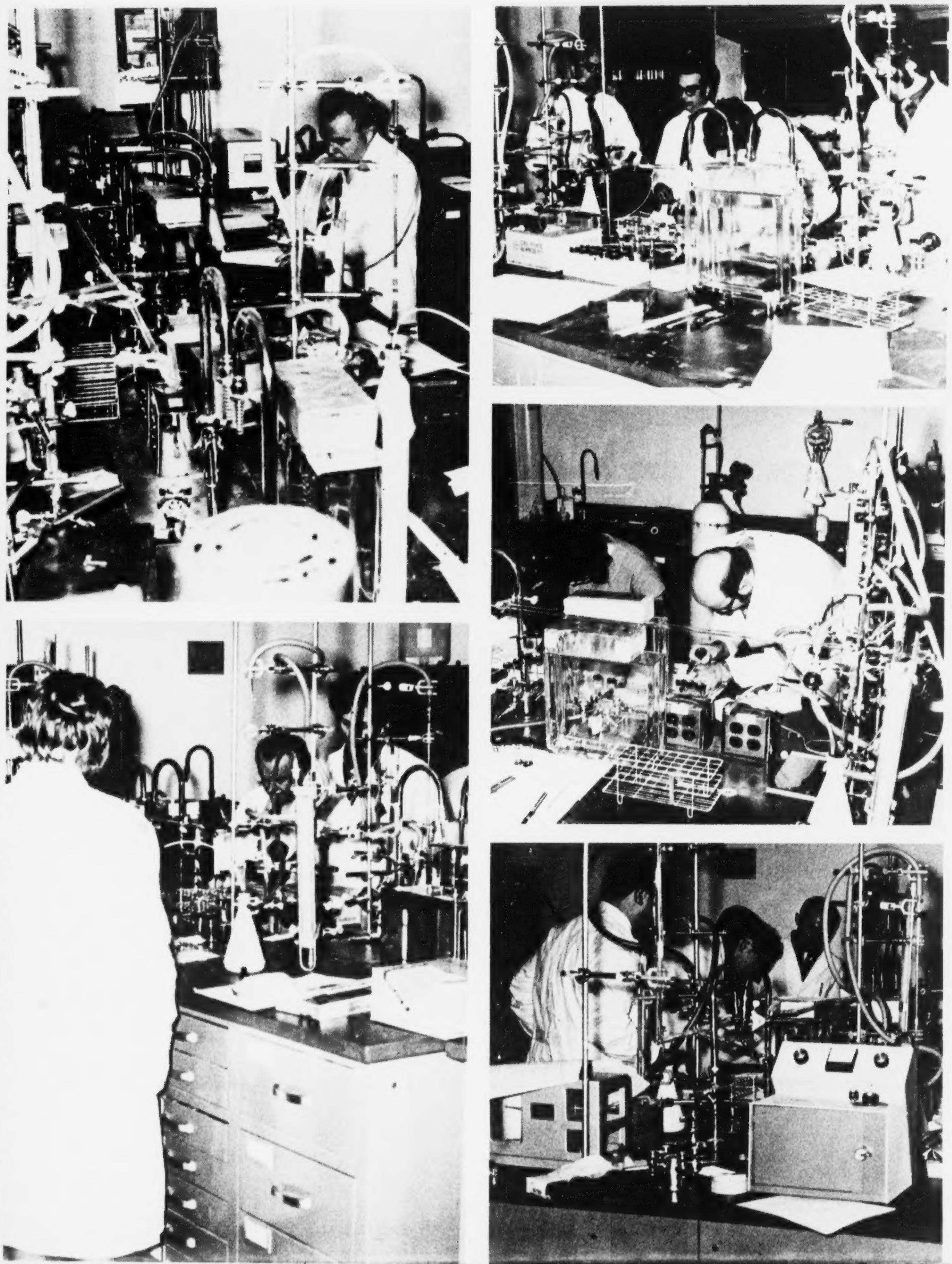




ADVANCED COURSES

Surveillance and Laboratory Techniques





Trainees participating in Analysis of Atmospheric Organic course at Research Triangle Park laboratories, January 1971.

Faculty
Surveillance and Laboratory Techniques Section of the Institute for Air Pollution Training

Stanley F. Sleva,	B.S., M.S., Chemistry
James L. Dicke,	B.A., Chemistry
	B.S., Meteorology
	M.S., Meteorology
Alfred H. Campbell,	B.S., Biology
	M.A., Biology
Ronald J. Drago	B.S., Chemistry
Edward J. Hanks, Jr.,	Associate of Science Chemical Technology
Thomas A. Hartlage,	B.S., Chemistry
David R. Hicks,	
Ronald C. Hilfiker,	B.S., Atmospheric Science
	M.S., Meteorology
Charles D. Pratt,	B.S., Mathematics
	M.P.A. Public Administration
Eugene G. Raybuck,	B.S., Science
Karl J. Zobel,	B.S., Biology
	M.S., Bacteriology

440

Special Topics in Surveillance and Laboratory Techniques

2-5 Days

● (By special arrangement upon written request)

The content of this seminar is adjusted to meet the needs of groups in specific geographical locations. Topics for discussion are carefully selected and designed to seek solutions to the problem areas described by the requestors. Arrangements for this special presentation are made through a written request to the appropriate OAP Regional Director.

67.

411

Air Pollution Meteor

5 Days

Meteorological effects and the role they play in the transport and dispersion of air pollution are delineated in this course presentation. It is designed for engineers and physical scientists responsible for measuring air pollution levels or for measuring and evaluating meteorological parameters which affect the diffusion and concentration of pollutants in the atmosphere. Each participant calculates estimates of continuous-release pollutant concentrations and becomes familiar with meteorological instrumentation and correct instrument exposure. Discussions are held which enable the trainee to evaluate air pollution control factors related to site selection, control programming, and the planning and interpretation of surveys, as well as sources of meteorological information and

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423

Diffusion of Air Pollution —

5 Days

This course is designed for meteorologists working in the field of air pollution who have had no formal training in atmospheric turbulence and diffusion. The course covers the development of selected theories of diffusion from the 1920's to the present, with emphasis on Pasquill's method of estimating pollutant concentrations as modified by Gifford. The application of diffusion and plume rise formulas to actual situations is discussed so that the student can evaluate the accuracy of his calculations. He learns to discuss and apply the concepts employed in several atmospheric dispersion models. He becomes familiar with turbulence instrumentation and learns data reduction techniques for use in the field.* Topics include:

411

Air Pollution Meteorology
5 Days

Meteorological effects and the role they play in the transport and dispersion of air pollution are delineated in this course presentation. It is designed for engineers and physical scientists responsible for measuring air pollution levels or for measuring and evaluating meteorological parameters which affect the diffusion and concentration of pollutants in the atmosphere. Each participant calculates estimates of continuous-release pollutant concentrations and becomes familiar with meteorological instrumentation and correct instrument exposure. Discussions are held which enable the trainee to evaluate air pollution control factors related to site selection, control programming, and the planning and interpretation of surveys, as well as sources of meteorological information and the availability of additional professional assistance. Problem assignments require a working knowledge of first year college mathematics. Topics include:

- Meteorological fundamentals
- Air pollution climatology
- Meteorology and air pollution effects in urban areas
- Atmospheric diffusion estimates
- Effective stack height
- Meteorological instruments and exposure
- Analysis of air quality and meteorological data
- Air pollution surveys
- Air pollution potential forecasts
- Meteorological models for air pollution control strategies

423

Diffusion of Air Pollution — Theory and Application
5 Days

This course is designed for meteorologists working in the field of air pollution who have had no formal training in atmospheric turbulence and diffusion. The course covers the development of selected theories of diffusion from the 1920's to the present, with emphasis on Pasquill's method of estimating pollutant concentrations as modified by Gifford. The application of diffusion and plume rise formulas to actual situations is discussed so that the student can evaluate the accuracy of his calculations. He learns to discuss and apply the concepts employed in several atmospheric dispersion models. He becomes familiar with turbulence instrumentation and learns data reduction techniques for use in the field.* Topics include:

- Statistical theory of turbulence
- Diffusion equations
- Estimates of pollution concentrations
- Plume rise
- Dispersion climatology
- Turbulence instrumentation and data reduction
- Dispersion modeling
- Forecasting air pollution potential

*Non-meteorologists requesting admission to this course should have completed Course 411 (Air Pollution Meteorology) or present evidence of similar prior training with their application.

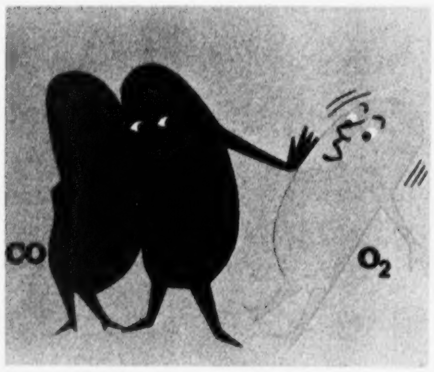
447

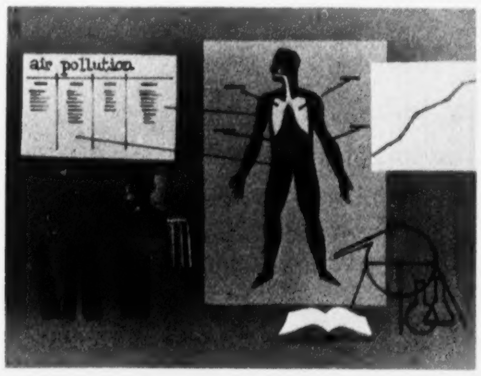
Meteorological Instrumentation in Air Pollution
5 Days

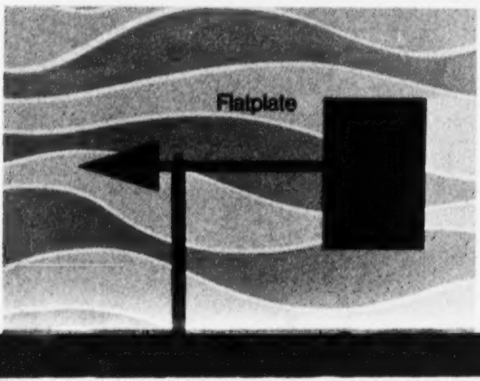
● *For non-meteorologists, Course 411 is a prerequisite for this course.*

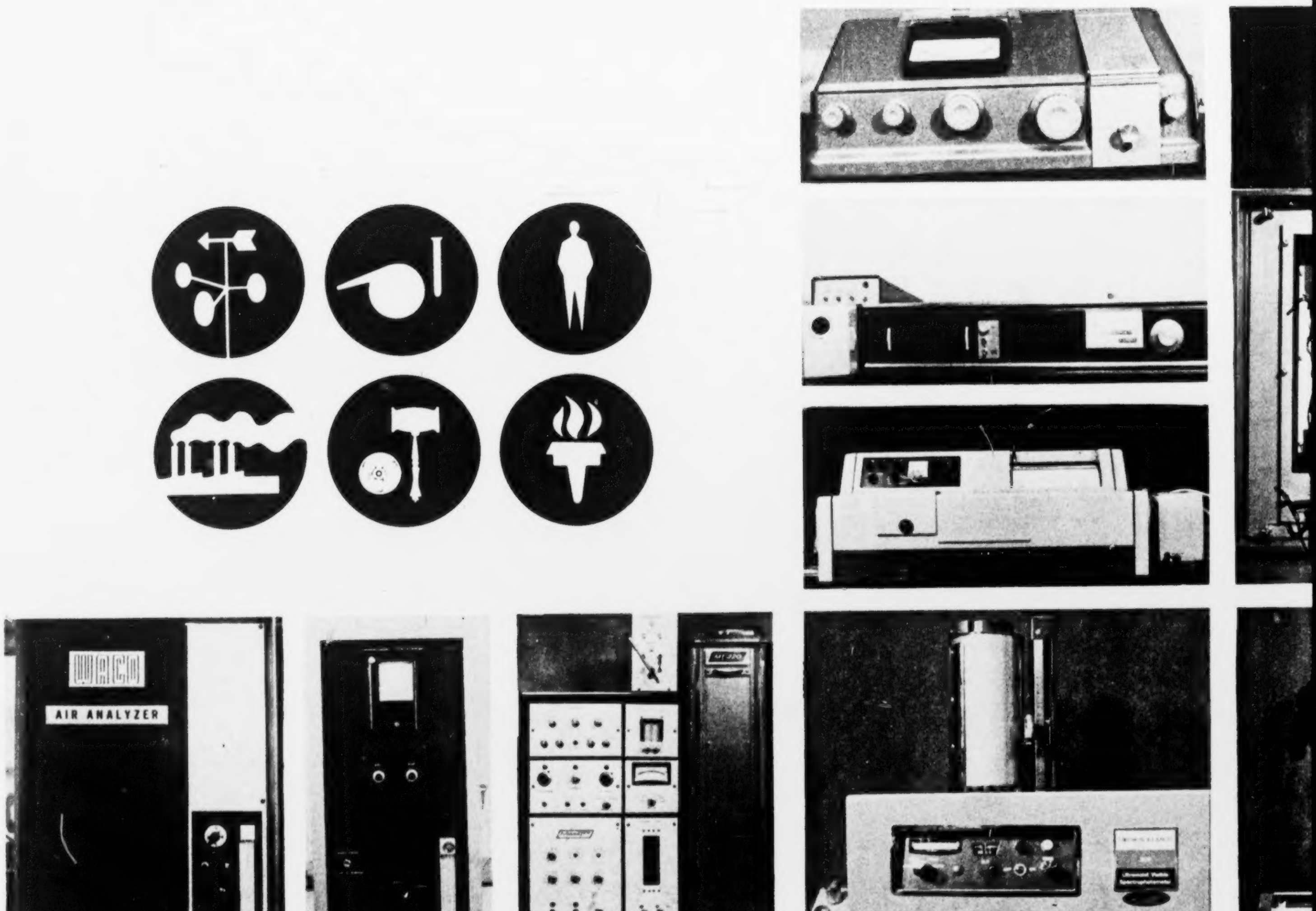
This course is designed for engineers and technical personnel responsible for designing, procuring and maintaining air pollution measuring instrument systems and networks that include meteorological sensors. At the conclusion of the course the trainee will understand the physical principles upon which instrumental sensing and recording of those weather elements important in air pollution are based. The student becomes acquainted with the desirable properties of a meteorological instrument system, their application and limitations with respect to specific types of measurement programs, and the evaluation of these properties by observing demonstrations and working exercises in the laboratory. The trainee becomes familiar with meteorological data reduction methods and computer programs for processing these data into tabulations and summaries. The student will also become familiar with existing air quality and meteorological instrument systems and telemetered networks. Topics include:

- Characteristics of meteorological instruments
- Principles of wind measuring systems
- Response characteristics of wind sensors and recorders
- Temperature measuring sensors for atmospheric stability
- Lapse rate measuring systems
- Telemetry in air pollution meteorology
- Data reduction methods and computer programs for meteorological tabulations and summaries
- Integrating meteorological and air quality instrumentation systems

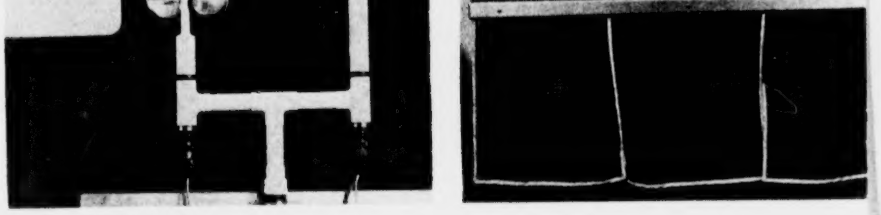








Faculty, and trainees attending courses, at the Institute for Air Pollution Training work with an interesting variety of up-to-date laboratory instrumentation.



ulty, and trainees attending courses, at the Institute for Air
lution Training work with an interesting variety of up-to-date
oratory instrumentation.

435

Atmospheric Sampling
5 Days

Course 422-A, or equivalent experience, is a prerequisite for course 435.

Offered to chemists, engineers, and technicians responsible for atmospheric sampling, for the primary purpose of teaching the student to select and apply sampling methods appropriate to air quality monitoring.

Approximately seventy-five percent of the course involves laboratory or work sessions in which the student will utilize the basic principles employed in atmospheric sampling. These principles consist of the calibration, location, and operation of air sampling devices. Lecture topics include:

Design of sampling systems including air movers, flow measuring devices, and collection devices.

Particulate sampling—Principles and applications:
- Deposition sampling
- Impactors and impingers
- Filtration
- Electrostatic precipitators
- Thermal precipitators

Gas sampling—Principles and applications:
- Grab sampling
- Freeze out (condensation)
- Adsorption
- Absorption
- Calibration techniques

409

Analysis of Atmospheric Inorganics
10 Days

(Laboratory determinations
relating to air quality standards)

Designed for professional chemists or other accredited personnel responsible for the analysis of atmospheric inorganics. The objective of this course is to guide the student in the selection of appropriate analytical methods.

Emphasis is placed on the recommended procedures for the determination of atmospheric concentrations of gaseous and particulate inorganic pollutants. Special emphasis is placed on the commonly accepted major pollutants.

Laboratory sessions comprise approximately 50 percent of the course, and each student develops proficiency in selected sampling and analytical procedures. Major topics include:

- Analysis for fluorides
- Analysis for oxides of nitrogen
- Analysis for sulfates and chlorides
- Analysis for sulfur compounds
- Calibration of sampling trains

Other topics discussed include:

- Analysis for oxidants
- Analysis for oxides of carbon
- Automatic and continuous monitoring
- Analysis for metals

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435

Atmospheric Sampling
5 Days

Design of sampling systems including air movers, flow measuring devices, and collection devices.

Particulate sampling—Principles and applications:
- Deposition sampling
- Impactors and impingers
- Filtration
- Electrostatic precipitators
- Thermal precipitators

Gas sampling—Principles and applications:
- Grab sampling
- Freeze out (condensation)
- Adsorption
- Absorption
- Calibration techniques

Air Metering devices—Applications and calibrations
Air movers—applications

Laboratory topics include
Calibration of the following air metering devices:
- Wet test meter
- Rotameter
- Limiting orifice meter
- Conventional orifice meter
- Calibration of a high-volume sampler
- Calibration of a tape sampler
- Determination of collection efficiency
- Determination of frit porosity
- Factors influencing collection efficiency

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409

Analysis of Atmospheric Inorganics
10 Days

(Laboratory determinations
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- Analysis for fluorides
- Analysis for oxides of nitrogen
- Analysis for sulfates and chlorides
- Analysis for sulfur compounds
- Calibration of sampling trains

Other topics discussed include:
- Analysis for oxidants
- Analysis for oxides of carbon
- Automatic and continuous monitoring
- Analysis for metals
- Electrical methods of analysis
- Optical methods of analysis
- Measurement of radionuclides in the atmosphere

Laboratory sessions:
- Determination of sulfur dioxide (manual method)
- Determination of nitrogen dioxide (manual method)
- Determination of oxidants (manual method)
- Determination of sulfates
- Determination of fluorides
- Continuous monitoring of selected pollutants

408

Analysis of Atmospheric Organi

10 Days

(Laboratory determinations
relating to air quality standards)

A fundamental knowledge of organic chemistry is a prerequisite for this course, which is designed for chemists and others responsible for chemical analysis of atmospheric samples. The objective is to provide course participants with an opportunity to perform specific analytical procedures for measuring organic pollutants in the ambient air. In this course, approximately 50 percent of the student's time will be spent in laboratories, separating, identifying, and measuring organic pollutants. Topics will include:

Nomenclature of organic compounds
Sampling for organic compounds
Theory and application of column chromatography
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Preparat

Laboratory

Separati
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Thin-lay

429

Gas Chromatographic Analysis of Air Pollutants

10 Days

(Laboratory determinations
relating to air quality standards)

Emphasis in this course is placed on the application of gas chromatography in air pollution investigations. It is designed for chemists and others responsible for the measurement of atmospheric pollution, and specifically those who have little or no experience with the technique of gas chromatographic analysis.

The course objective is to introduce the student to the basic theory of gas chromatography and develop an understanding of the operational role of the various components of a gas chromatograph, including the column, carrier gas, sample injector, detector, and recorder.

Approximately 65 percent of the student's time is spent in the laboratory, setting up and calibrating gas chromatographs and performing qualitative and quantitative analysis of unknown samples. Topics include:

Basic theory of gas chromatography
Gas chromatographic column parameters
Characteristics of the flame ionization detector
Charac
Sampl
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Laboratory

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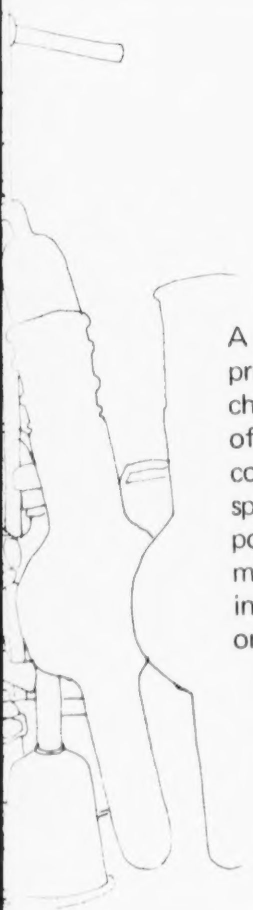

408

Analysis of Atmospheric Organics

10 Days

(Laboratory determinations
relating to air quality standards)

A fundamental knowledge of organic chemistry is a prerequisite for this course, which is designed for chemists and others responsible for chemical analysis of atmospheric samples. The objective is to provide course participants with an opportunity to perform specific analytical procedures for measuring organic pollutants in the ambient air. In this course, approximately 50 percent of the student's time will be spent in laboratories, separating, identifying, and measuring organic pollutants. Topics will include:

Nomenclature of organic compounds
Sampling for organic compounds
Theory and application of column chromatography
Introduction to thin-layer chromatography
Introduction to gas chromatography
Absorption spectroscopy
Activation analysis of air pollutants
Preparation of controlled atmospheres

Laboratory sessions will cover:

Separation of organic pollutants
Ultra-violet absorption analysis
Visible absorption analysis
Gas chromatographic analysis
Continuous analyzers
Thin-layer chromatographic analysis

429

Gas Chromatographic Analysis of Air Pollutants

10 Days

(Laboratory determinations
relating to air quality standards)

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ph, including
the column, carrier gas, sample injector, detector, and recorder.

Approximately 65 percent of the student's time is spent in the laboratory, setting up and calibrating gas chromatographs and performing qualitative and quantitative analysis of unknown samples. Topics include:

Basic theory of gas chromatography
Gas chromatographic column parameters
Characteristics of the flame ionization detector
Characteristics of the electron capture detector
Sample handling in gas chromatography
Calculations in gas chromatography

Laboratory sessions:

Setting up and calibrating gas chromatographs
Determination of aliphatic hydrocarbons
Determination of aromatic hydrocarbons
Determination of polynuclear hydrocarbons

448

Effects on Vegetation

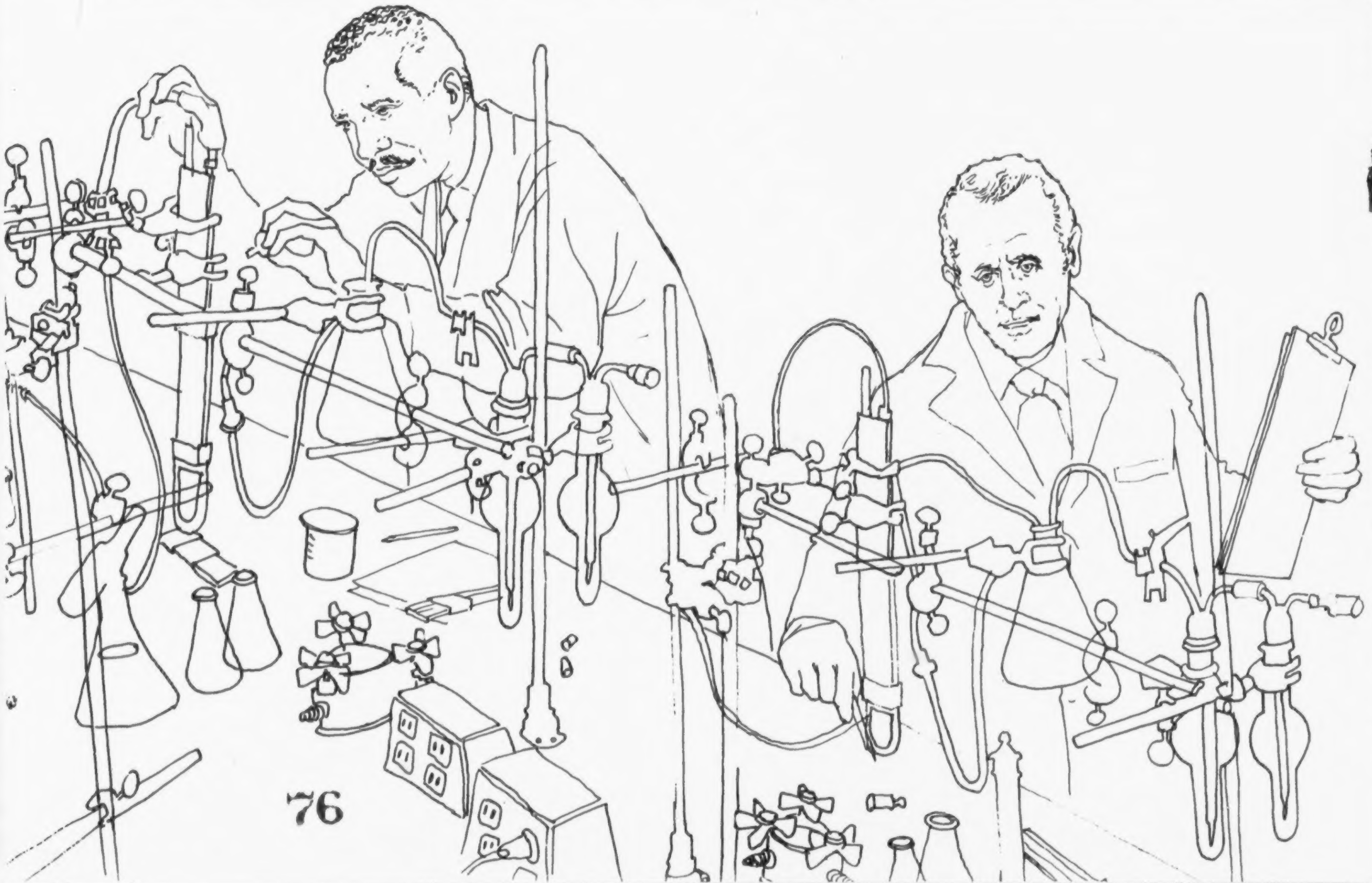
3 Days

● (By special arrangement)

Instruction in this course is designed specifically for State, county, and local agricultural agency personnel. Participants receive basic knowledge and instruction in the methods used to identify various types of air pollution damage to vegetation. Special emphasis is given to data evaluation and procedures recommended for assessing and tabulating economic losses. Topics include:

Air pollution injuries to vegetation
Compiling reports
Data evaluation
Diagnosing plant problems
Effects of gaseous pollutants
Effects of particulate pollutants
Methods of assessing
air pollution injury to vegetation

The primary objective of this special course is to develop a national network of qualified specialists, who upon completion of the course, will participate in follow-up surveys designed to compile data pertaining to air pollution damage to vegetation.



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3 Days

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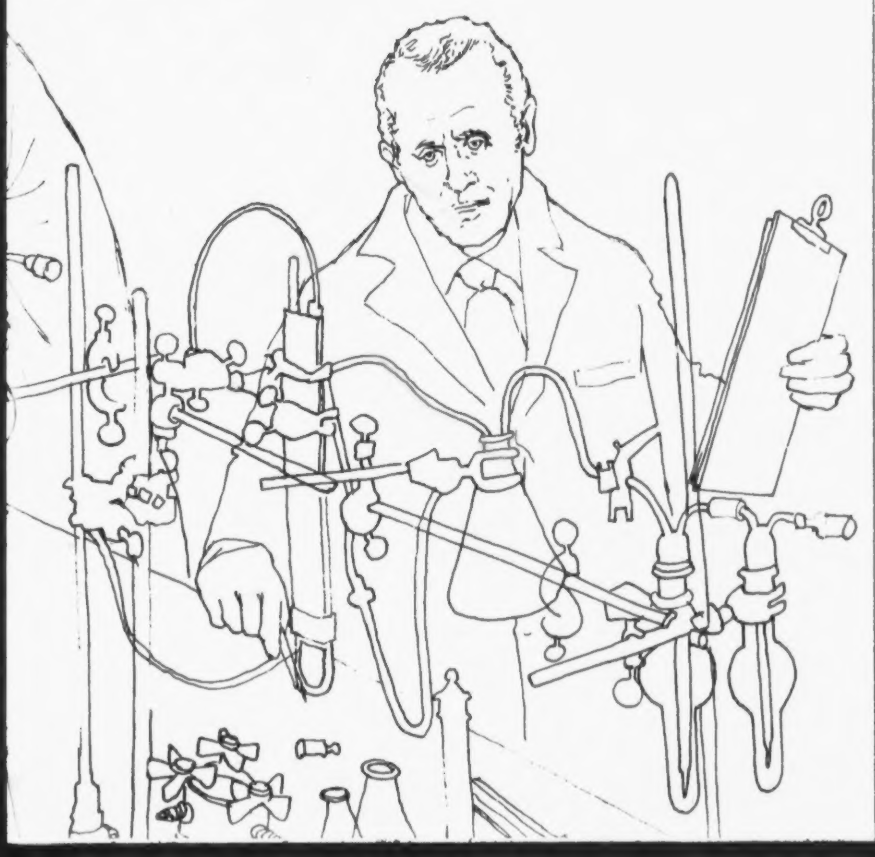
Diagnosing plant problems
Effects of gaseous pollutants
Effects of particulate pollutants
Methods of assessing
air pollution injury to vegetation

The primary objective of this special course is to develop a national network of qualified specialists, who upon completion of the course, will participate in follow-up surveys designed to compile data pertaining to air pollution damage to vegetation.



453

Analysis of Atmospheric Pollutants
(for technicians only)
10 Days

Designed exclusively for technicians responsible for routine analytical analyses of atmospheric pollutants.

The studies pursued in this course include the determination of gaseous and particulate pollutants, both inorganic and organic. Special emphasis is placed upon the methods recommended in conjunction with the National Primary and Secondary Ambient Air Quality Standards.

Approximately 75 percent of the student's time is spent in laboratory sessions. Major topics include:

Calibration and standardization techniques

Principles of air pollution analysis,
including analyses of:
Sulfur oxides
Nitrogen oxides
Metals
Fluorides
Oxidants
Carbon monoxide
Hydrocarbons
Aldehydes

420

Air Pollution Microscopy
5 Days

This course is designed for chemists, engineers and other professional personnel responsible for the identification of airborne particulates. Laboratory sessions enable the student to recognize and identify atmospheric particulates.

Instruction is designed to afford the trainee a basic understanding of the procedures required to obtain representative samples of atmospheric pollutants that are characterized by microscopic examination.

The course consists of lectures, laboratory exercises, and field exercises. The trainees obtain a knowledge of the component parts of the polarizing microscope and their functions. They are also familiarized with the special sampling and sample handling techniques used in microscopic analysis. During the laboratory sessions the trainees prepare slides. They also examine pure substances, plus samples which they have collected. Topics include:

- Sampling for particulates
- Optics and illumination
- Polarization and the polarizing microscope
- Morphology of natural particulates
- Morphology of industrial dust and combustion products
- Micrometry — counting and sizing
- Crystal morphology
- Measurement of refractive index
- Dispersion staining
- Photomicrography

405

Sampling and Identification of Ae
5 Days

Instruction in this course is designed to enable the trainee to discuss and use various allergen sampling equipment, to identify selected aero-allergens, and to perform calculations necessary to arrive at a quantitative assessment of the allergens present in an atmospheric sample. This course is specifically designed for professional workers concerned with the sampling and identification of atmospheric allergens.

Trainees spend approximately one-half of the course time in laboratory sessions and field exercises, which include setting up sampling equipment and collecting
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436

Determination and Measurement
10 Days

This course is designed for chemists and other scientific personnel responsible for the qualitative and quantitative determination of metals present in the atmosphere. A fundamental knowledge of analytical chemistry is necessary.

Students are given a working knowledge of separation and analysis techniques for the metallic pollutants present in ambient air. Approximately 60 percent of the student's time is spent in the laboratory, separating, identifying, and measuring metallic pollutants. Subjects include:

- Sampling for metallic compounds
- Separation techniques
- Colorin
- Polaro
- Emissio
- Atomic

Laborator

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- Polaro
- Atomic

405

Sampling and Identification of Aero-Allergens
5 Days

Instruction in this course is designed to enable the trainee to discuss and use various allergen sampling equipment, to identify selected aero-allergens, and to perform calculations necessary to arrive at a quantitative assessment of the allergens present in an atmospheric sample. This course is specifically designed for professional workers concerned with the sampling and identification of atmospheric allergens.

Trainees spend approximately one-half of the course time in laboratory sessions and field exercises, which include setting up sampling equipment and collecting allergen samples. Later, in the microscopy laboratory, they identify and count the allergens in the collected samples. Topics include:

Allergen sampling devices
Sample preparation and handling techniques
Human response to airborne allergens
Dispersion and climatological effects of pollens and spores
Counting and sizing techniques
Biology and morphology of pollen
Biology and morphology of fungus spores

436

Determination and Measurement of Atmospheric Metals
10 Days

This course is designed for chemists and other scientific personnel responsible for the qualitative and quantitative determination of metals present in the atmosphere. A fundamental knowledge of analytical chemistry is necessary.

Students are given a working knowledge of separation and analysis techniques for the metallic pollutants present in ambient air. Approximately 60 percent of the student's time is spent in the laboratory, separating, identifying, and measuring metallic pollutants. Subjects include:

Sampling for metallic compounds
Separation techniques
Colorimetric methods of analysis
Polarographic analysis
Emission spectroscopy
Atomic absorption spectroscopy

Laboratory sessions:

Particulate sampling preparation, including sampling, ashing, and acid digestion
Colorimetric analysis by formation of metallic complexes
Operation of an emission spectrograph and interpretation of data
Polarographic analysis of metals
Atomic absorption analysis of metals

Students attending Air Pollution Meteorology course at Research Triangle Park facilities, January 1971.

INSTITUTE FOR AIR POLLUTION TRAINING

SCHEDULE OF RESIDENT

1971 · 1972

All Resident Courses are scheduled for presentation
At the Environmental Protection Agency's facilities at Research Triangle Park, N.C. 27711
Applicants will receive advance notice of classroom and/or laboratory locations.

1971 Dates	Course Number	Course Title
July 12-July 31	452	Principles and Practice of Air Pollution Control (Basic 3-Week course)
August 9-August 28	452	Principles and Practice of Air Pollution Control (Basic 3-Week course)
August 9-13	450	Source Sampling
September 7-September 25	452	Principles and Practice of Air Pollution Control (Basic 3-Week course)
September 27-October 1	450	Source Sampling
October 18-22	450	Source Sampling
October 26-November 13	452	Principles and Practice of Air Pollution Control (Basic 3-Week course)
November 1-5	431	Air Pollution Control Technology

1971 Dates	Course Number	Cours
November 9-11	444	Air P
November 15-19	450	Sourc
November 29-December 3	435	Atm
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November 29-December 3	431	Air P
November 30-December 2	444	Air P
November 30-December 2	431	Air P
December 6-10	420	Air P
December 6-10	411	Air P

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SCHEDULE
OF RESIDENT COURSES
1971 · 1972

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1971 Dates	Course Number	Course Title
November 9-11	444	Air Pollution Field Enforcement
November 15-19	450	Source Sampling
November 29- December 3	435	Atmospheric Sampling
November 29- December 3	450	Source Sampling
November 29- December 3	431	Air Pollution Control Technology
November 30- December 2	444	Air Pollution Field Enforcement
November 30- December 2	431	Air Pollution Control Technology
December 6-10	420	Air Pollution Microscopy
December 6-10	411	Air Pollution Meteorology

1972 Dates	Course Number	Course Title
January 10-14	411	Air Pollution Meteorology
January 10- January 29	452	Principles and Practice of Air Pollution Control (Basic 3-Week course)
January 17-21	413	Control of Particulate Emissions
January 18-20	439	Visible Emissions Evaluation
January 24-28	415	Control of Gaseous Emissions
January 24- February 4	409	Analysis of Atmospheric Inorganics (2-Weeks)
February 1-3	439	Visible Emissions Evaluation
February 7-18	409	Analysis of Atmospheric Inorganics (2-Weeks)
February 7- February 26	452	Principles and Practice of Air Pollution Control (Basic 3-Week course)
February 28- March 10	408	Analysis of Atmospheric Organics (2-Weeks)
February 29- March 2	439	Visible Emissions Evaluation
March 6-10	411	Air Pollution Meteorology
March 6-25	452	Principles and Practice of Air Pollution Control (Basic 3-Week course)
March 13-17	450	Source Sampling
March 13-24	408	Analysis of Atmospheric Organics (2-Weeks)
March 14-16	439	Visible Emissions Evaluation
March 20-24	413	Control of Particulate Emissions
March 27-31	450	Source Sampling
March 27-31	415	Control of Gaseous Emissions
March 28-30	439	Visible Emissions Evaluation
April 10-14	450	Source Sampling
April 10-21	429	Gas Chromatographic Analysis of Air Pollutants (2-Weeks)
April 10- April 29	452	Principles and Practice of Air Pollution Control (Basic 3-Week course)
April 17-21	405	Identification of Aero-Allergens
April 24-28	450	Source Sampling

1972 Dates	Course Numbe
April 24- May 5	429
April 25-27	439
May 1-5	427
May 8-19	426
May 8-19	453
May 8-12	41
May 22-26	450
May 22-26	423
May 30- June 17	452
June 5-9	448
June 5-16	436
June 6-8	439
June 19-30	436
June 26-30	447

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1972 Dates	Course Number	Course Title
April 24-May 5	429	Gas Chromatographic Analysis of Air Pollutants (2-Weeks)
April 25-27	439	Visible Emissions Evaluation
May 1-5	427	Combustion Evaluation
May 8-19	426	Statistical Evaluation of Air Pollution Data (2-Weeks)
May 8-19	453	Analysis of Atmospheric Pollutants (2-Weeks, for Technicians only)
May 8-12	411	Air Pollution Meteorology
May 22-26	450	Source Sampling
May 22-26	423	Diffusion of Air Pollution – Theory and Application
May 30-June 17	452	Principles and Practice of Air Pollution Control (Basic 3-Week course)
June 5-9	448	Air Pollution Effects on Vegetation
June 5-16	436	Determination and Measurement of Atmospheric Metals (2-Weeks)
June 6-8	439	Visible Emissions Evaluation
June 19-30	436	Determination and Measurement of Atmospheric Metals (2-Weeks)
June 26-30	447	Meteorological Instrumentation in Air Pollution

● Courses 408, 409, 426 and 429 emphasize laboratory determinations relating to air quality standards.

● Course 453 for Technicians only.

INSTITUTE FOR AIR POLLUTION TRAINING

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The following courses have been scheduled for presentation at the locations listed on the opposite page. Additional information may be obtained from the Registrar of the Institute for Air Pollution Training, at Research Triangle Park, N.C. 27711 Application forms are provided on pages 100 to 108.

INSTITUTE
AIR POLLUTION
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SCHEDULE
OF FIELD COURSES
1971 · 1972

rses have been scheduled for presentation
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ation may be obtained
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gle Park, N.C. 27711
are provided on pages 100 to 108.

1971

Austin, Texas area	Course Number	Course Title and Location
June 12–23	426	Statistical Evaluation of Air Pollution Data (2-Weeks, Austin, Texas)
August 16–20	435	Atmospheric Sampling (Austin, Texas)
Boston, Massachusetts area		
July 13–15	439	Visible Emissions Evaluation (Barre, Vermont)
October 26–28	444	Air Pollution Field Enforcement (Winchester, Massachusetts)
Chicago, Illinois area		
August 17–19	439	Visible Emissions Evaluation (Indianapolis, Indiana)
September 14–16	439	Visible Emissions Evaluation (Madison, Wisconsin)
Cincinnati, Ohio area		
August 17–19	439	Visible Emissions Evaluation (Indianapolis, Indiana)
September 21–23	444	Air Pollution Field Enforcement (Cincinnati, Ohio)
December 13–17	435	Atmospheric Sampling (Cincinnati, Ohio)
Denver, Colorado area		
September 20–24	435	Atmospheric Sampling (Denver, Colorado)
October 4–8	411	Air Pollution Meteorology (Denver, Colorado)
October 18–22	431	Air Pollution Control Technology (Denver, Colorado)
Kansas City, Missouri area		
August 31– September 2	439	Visible Emissions Evaluation (Kansas City, Missouri)
September 13–17	431	Air Pollution Control Technology (Kansas City, Missouri)
New York, New York area		
October 5–7	444	Air Pollution Field Enforcement (Edison, New Jersey)
October 18–22	435	Atmospheric Sampling (Edison, New Jersey)
Seattle, Washington area		
July 19–23	435	Atmospheric Sampling (Redmond, Washington)
August 2–6	431	Air Pollution Control Technology (Redmond, Washington)

1971

Seattle, Washington area
August 3–5
October 4–8

1972

Chicago,Illinois area
May 9–11

Denver, Colorado area
February 28– March 3
March 6–10
June 26–30

Kansas City, Missouri area
January 31– February 4
February 7–11

New York, New York area
February 14-25
May 22-26
June 5–9

San Francisco, California area
June 19–23
June 26–30

Seattle, Washington area
May 1–5
May 8–12

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1971

Seattle, Washington area	Course Number	Course Title and Location
August 3–5	439	Visible Emissions Evaluation (Anchorage, Alaska)
October 4–8	420	Air Pollution Microscopy (Redmond, Washington)

1972

Chicago, Illinois area	Course Number	Course Title and Location
May 9–11	439	Visible Emissions Evaluation (Chicago, Illinois)
Denver, Colorado area		
February 28– March 3	413	Control of Particulate Emissions (Denver, Colorado)
March 6–10	415	Control of Gaseous Emissions (Denver, Colorado)
June 26–30	427	Combustion Evaluation (Denver, Colorado)
Kansas City, Missouri area		
January 31– February 4	413	Control of Particulate Emissions (Kansas City, Missouri)
February 7–11	415	Control of Gaseous Emissions (Kansas City, Missouri)
New York, New York area		
February 14-25	426	Statistical Evaluation of Air Pollution Data (2-Weeks, Edison, New Jersey)
May 22-26	420	Air Pollution Microscopy (Edison, New Jersey)
June 5–9	427	Combustion Evaluation (Edison, New Jersey)
San Francisco, California area		
June 19–23	413	Control of Particulate Emissions (San Francisco, California)
June 26–30	415	Control of Gaseous Emissions (San Francisco, California)
Seattle, Washington area		
May 1–5	413	Control of Particulate Emissions (Redmond, Washington)
May 8–12	415	Control of Gaseous Emissions (Redmond, Washington)

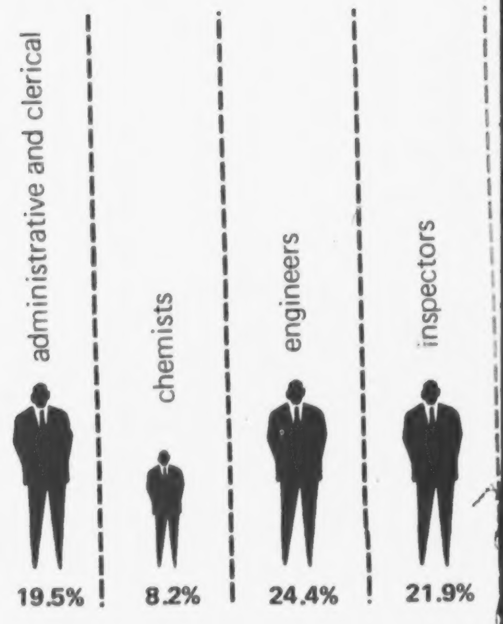

Figure One: 1969 Distribution (by o
Local Air Pollution Control Agency Ma

PLANNING AND SPECIAL PROJEC

Designing programs to meet national manpower and training needs in the field of air pollution control is a primary responsibility of the Planning and Special Projects staff. Major emphasis is placed upon providing support and assistance at State and local levels. Programs are designed to increase the national resource of qualified professional and technical manpower, to make employment opportunities in air pollution control more attractive to applicants, to find more efficient means of utilizing existing manpower, and to upgrade the technical competency of air pollution control agency personnel.

The Planning and Special Projects staff has the additional responsibility of assuring the most effective career development and training of Office of Air Programs professional, managerial and technical personnel. A continuing evaluation of human resources, program responsibilities, and personnel management is required in order to insure maximum benefits for both the individual and the Office of Air Programs.

Career planning is essential to the effective utilization and retention of the Office of Air Programs' multidisciplinary staff. There is no single occupational field involved in solving air pollution problems, but rather, the distinctive requirements involve the application of a broad spectrum of skills and knowledge in more than 50 career disciplines.

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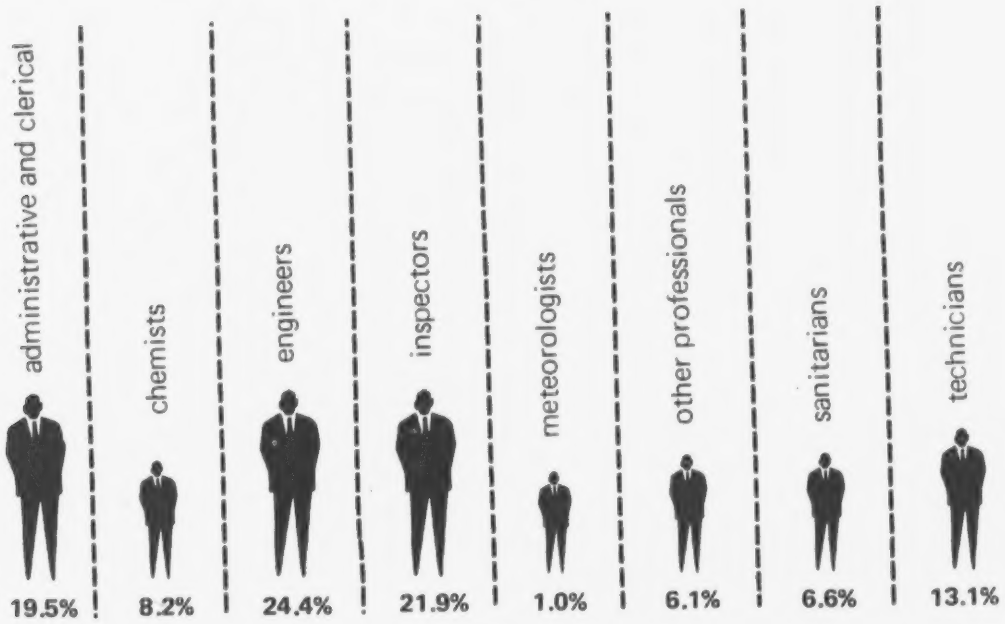

Figure One: 1969 Distribution (by occupation) of State and Local Air Pollution Control Agency Manpower.

SPECIAL PROJECTS

t effective career development and training)ffice of Air Programs professional, manial and technical personnel. A continuing uation of human resources, program resibilities, and personnel management is reed in order to insure maximum benefits for the individual and the Office of Air Pros.

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Thus, the functions of the Planning and Special Projects staff are to determine national manpower and training needs in cooperation with State and local air pollution control agencies, coordinate the program planning required to meet these needs and to insure the continuing career development and scientific growth of Office of Air Programs managerial, professional and technical personnel.

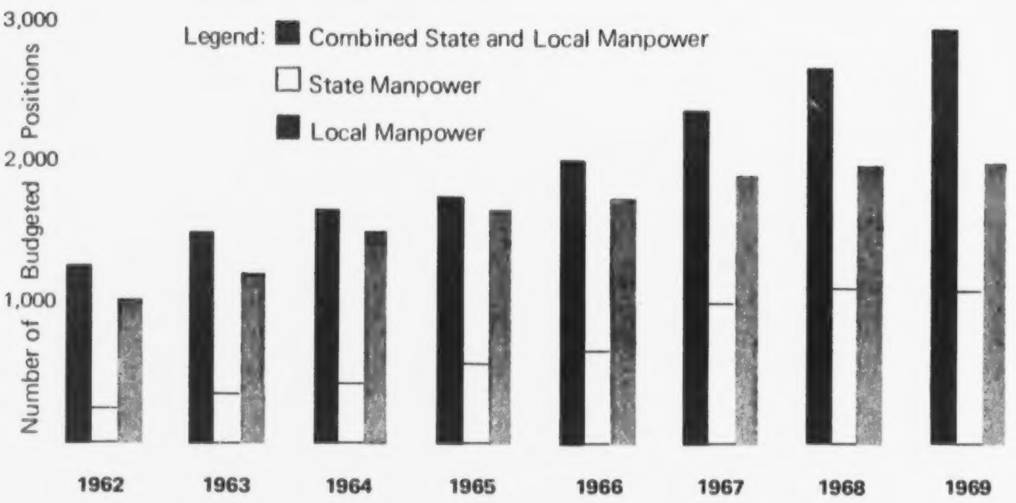

Figure Two: Growth in Budgeted Positions,* 1962 to 1969

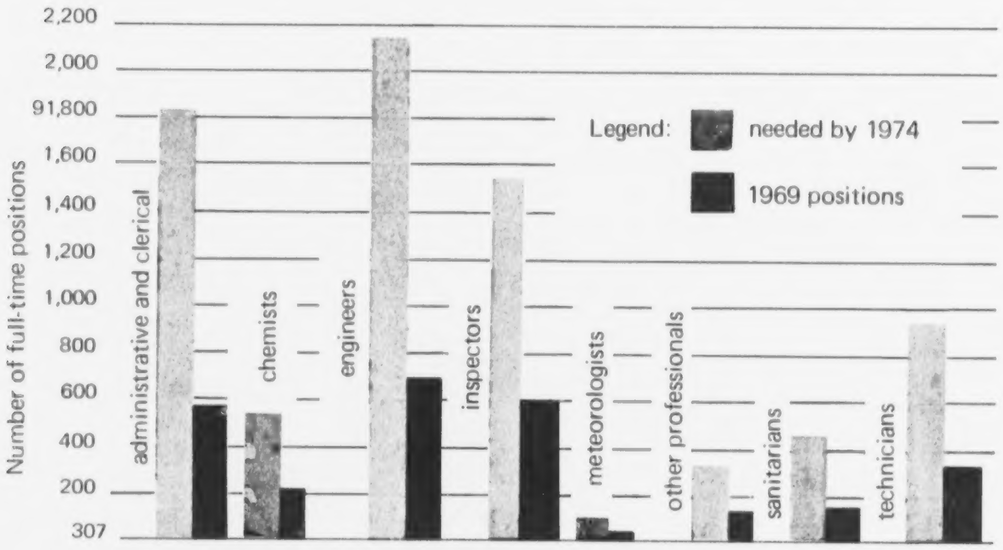

Figure Three: Manpower needed by Occupation through 1974

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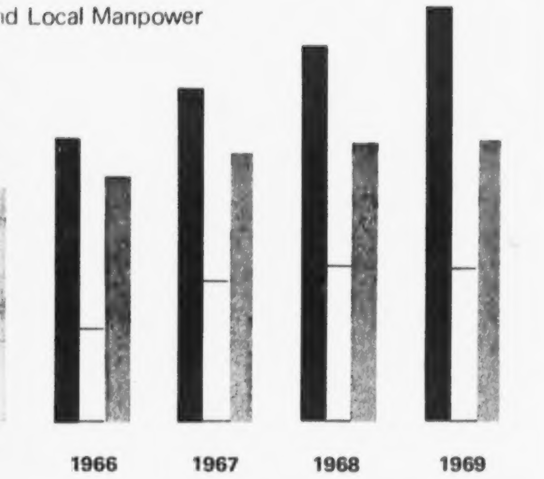
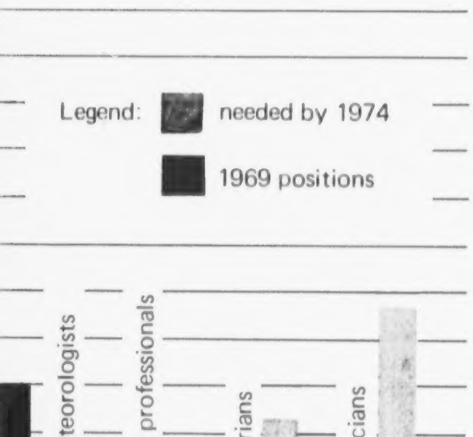


Positions,* 1962 to 1969



by Occupation through 1974

UNIVERSITY CONSORTIA FOR ENVIRONMENTAL PROTECTION

Groups of major universities are redirecting their talents and resources toward a new effort to combat air pollution and other environmental protection problems through the formation of university consortia. While initially their efforts are directed largely to air pollution control, it is expected that they will gradually expand to embrace other critical environmental areas. At present, four such consortia have been formally established.

A university consortium is an organization of academic institutions designed to have measurable impact upon environmental control through its training program and service activities. A major responsibility of a consortium is to plan, design, and conduct a coordinated training program, primarily at the master's level, directed at air pollution control. While embracing traditional areas such as meteorology, emission control, and sampling and analysis, the program includes some involvements in land-use planning, transportation planning, legislation, economic and other effects, implementation plan development, standard setting, and episode control plans. The program exhibits an intensive orientation toward problem solving. A consortium is not meant to represent individual strengths of the participating universities, but rather to combine these strengths into an integrated coherent effort. Supported by the faculties of the participating universities, a consortium eliminates the need for duplication of programs in the individual universities and provides better training to a greater number at a lower cost per student than could be provided by individual universities. Consortia are constituted to increase capability in handling multidisciplinary problems requiring the competence and resources of varied institutions. Such training programs are attractive to industry as well as public control agencies, since both require personnel with similar knowledge and skills.

"Air pollution is a social problem," said Dr. John T. Middleton, Deputy Assistant Administrator for Air Programs, who added that its solution depends on public understanding and political action. Assistance in these areas will be of prime concern to consortia universities.

Dr. Harry P. Kramer, Director, Office of Manpower Development, said that new, more effective efforts are essential to meet the qualitative and quantitative manpower needs of State and local control agencies. A concurrent need exists to develop a system to provide a broad spectrum of technical assistance to these agencies. For example, faculty members aligned with consortia, and consortia as organizations, will become involved with lawmakers, planners, citizens' groups, and most importantly, with State and local agency directors by providing technical services and other assistance dealing with long-range problems. Consortia programs will be an important means of developing and training manpower for State and local air pollution control agencies.

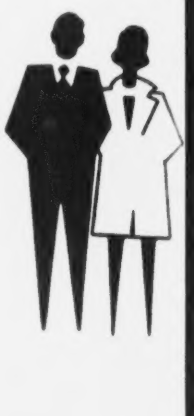
The university consortia on air pollution which have been formally established are as follows:

Triangle Universities Consortium on A
Established January 1970
University of North Carolina, Duke U
North Carolina State University.

New England Universities Consortium
Established November 1970
Northeastern University, University of
Massachusetts Institute of Technology
Harvard University, Lowell Technolog
Tufts University.

Pacific Southwest Universities Air Pol
Established March 1971
University of Southern California,
University of California, Irvine; Unive
and University of California, Riverside

Middle Atlantic Universities Consortiu
Established May 1971
City College of the City University o
Cooper Union, Drexel University, Ne
Pennsylvania State University, Polytec
Princeton University, Newark College
Temple University, Rensselaer Polytec
and University of Delaware.



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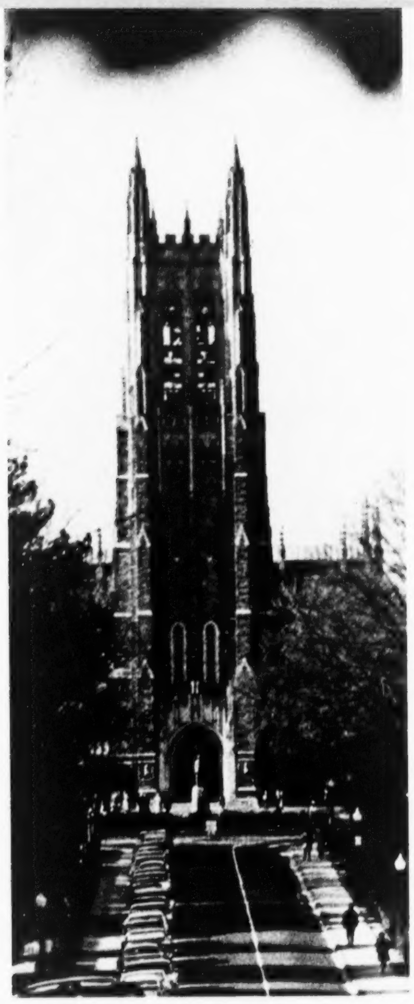
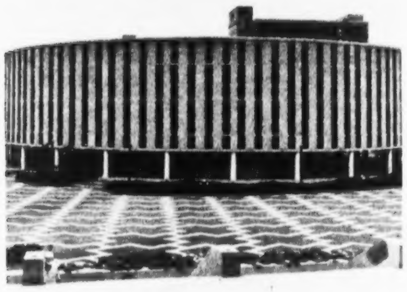
Triangle Universities Consortium on Air Pollution
Established January 1970
University of North Carolina, Duke University and
North Carolina State University.

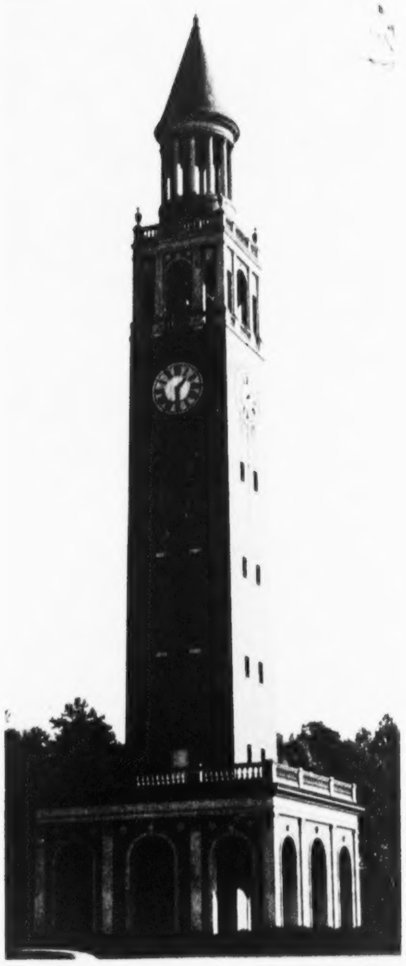
New England Universities Consortium on Air Pollution
Established November 1970
Northeastern University, University of Massachusetts,
Massachusetts Institute of Technology, Boston University,
Harvard University, Lowell Technological Institute and
Tufts University.

Pacific Southwest Universities Air Pollution Association
Established March 1971
University of Southern California,
University of California, Irvine; University of California, Los Angeles;
and University of California, Riverside.

Middle Atlantic Universities Consortium on Air Pollution
Established May 1971
City College of the City University of New York,
Cooper Union, Drexel University, New York University,
Pennsylvania State University, Polytechnic Institute of Brooklyn,
Princeton University, Newark College of Engineering,
Temple University, Rensselaer Polytechnic Institute,
and University of Delaware.


Duke University


North Carolina State University


Jniversity of North Carolina

Triangle Universities Air Pollution Consortium facilitates and coordinates joint and cooperative action by and among the Triangle Universities of North Carolina in the promotion of research and educational endeavors related to air pollution.

Officers of the Triang
Established January 1

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Vice-Chairman

David B. Marsland, Ph.D.
Department of Chemical
North Carolina State Unive
Raleigh, North Carolina

Robert Barnes, Ph.D.
School of Forestry, Duke
Durham, North Carolina

Nor

Jay L. A
Directo
North C
Raleigh

James K. Ferrell, Ph.D.
Department of Chemical Er
North Carolina State Univer
Raleigh, North Carolina

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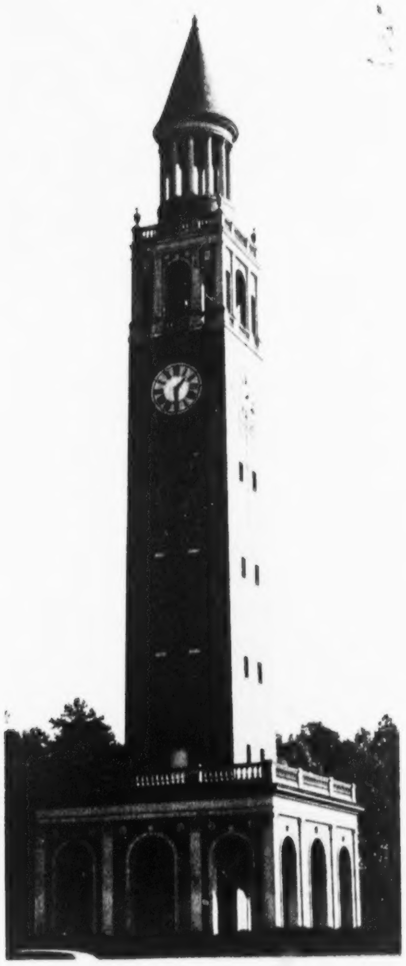
William McFarland, Ph.D.
Department of Economics
University of North Carolin
Chapel Hill, North Carolin



Jniversity of North Carolina

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Officers of the Triangle Universities Consortium on Air Pollution
Established January 1970

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Raleigh, North Carolina

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Lowell, Massachusetts

(above) Winter at the University of Massachusetts, campus center is in background.

(right) A scale model of the new 75,000 square foot Educational Facilities Building under construction at the Harvard School of Public Health.

(lower right) Dome and pillars of Massachusetts Institute of Technology, as seen from the Great Court.

(below) University of Massachusetts at Amherst.

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Air Pollution

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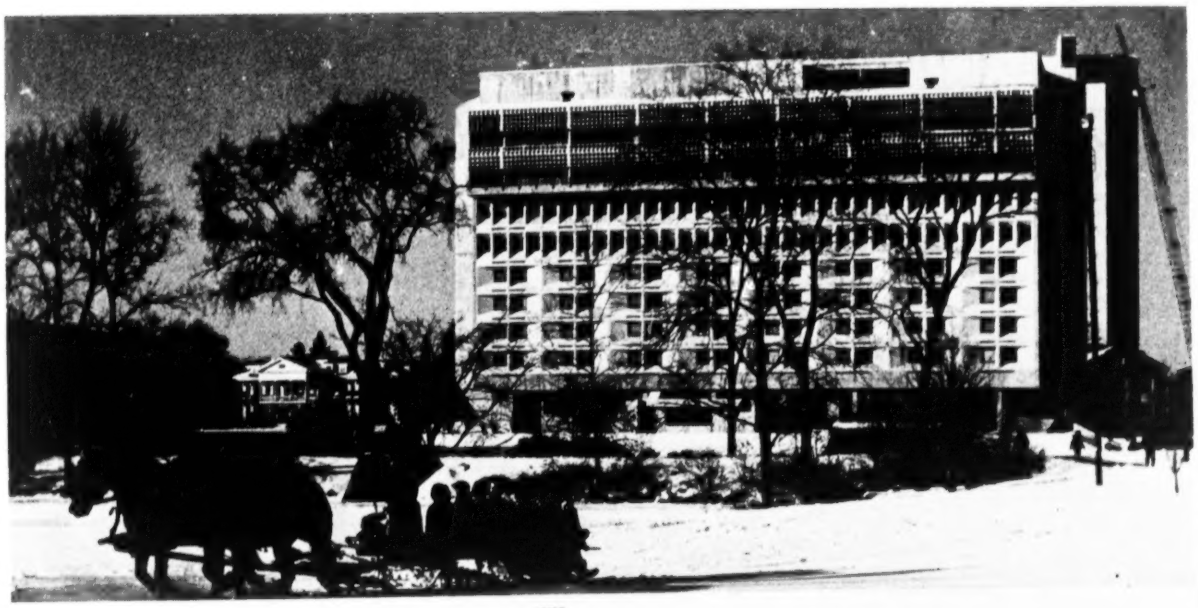
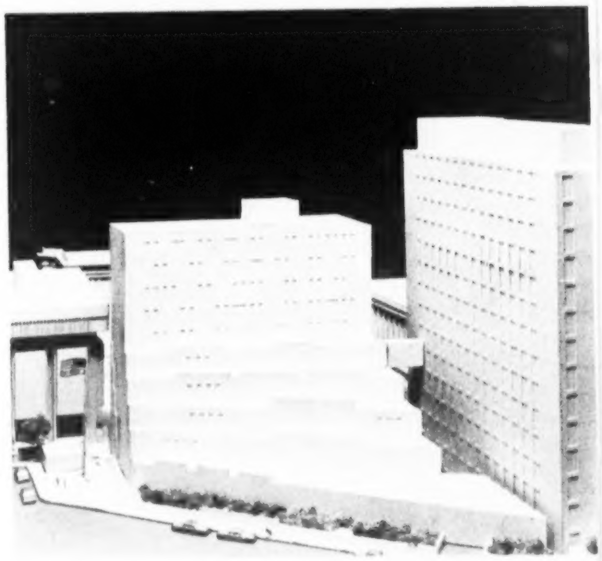


(above) Winter at the University of Massachusetts, campus center is in background.

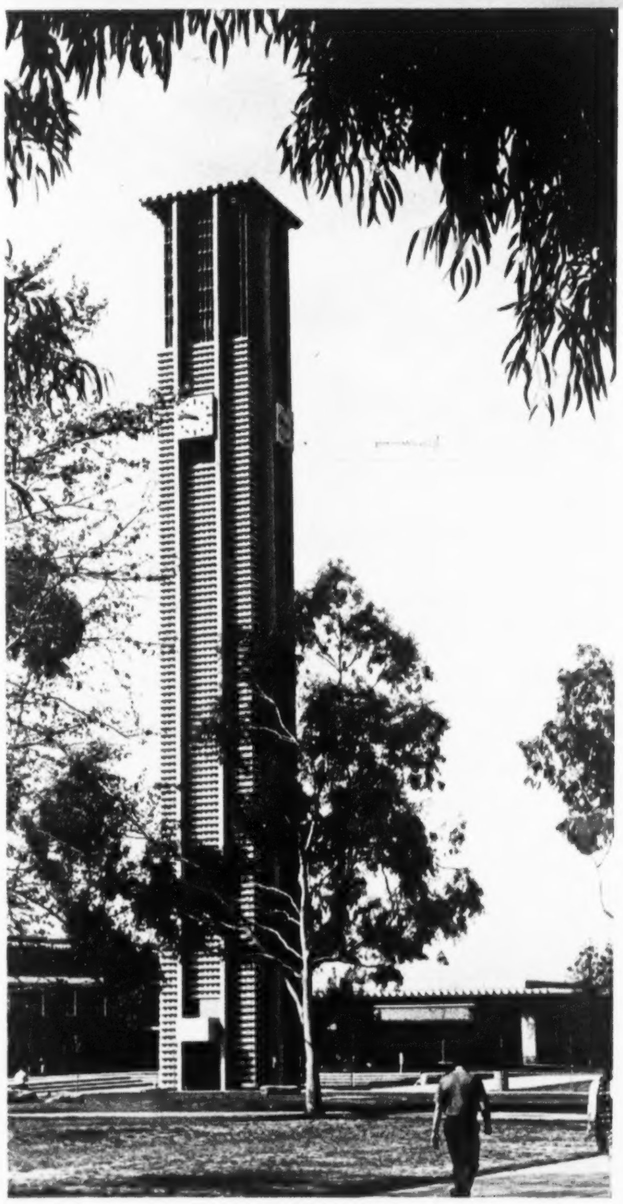


(right) A scale model of the new 75,000 square foot Educational Facilities Building under construction at the Harvard School of Public Health.

(lower right) Dome and pillars of Massachusetts Institute of Technology, as seen from the Great Court.

(below) University of Massachusetts at Amherst.

MASSACHVSETTS INSTITVTE OF TECHNOLOGY



(left) University of California at Riverside.

(below) View of the UCLA Court of Sciences facing north, with Boelter Hall (Engineering) on left, Chemistry and Geology Buildings on right, and Mathematical Sciences Bldg. in center (with observation domes).

Officers of the Pacific S

Established March 197

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Los Angeles, California

University of California, Rive

O. Clifton Taylor, Ph.D.
Associate Director
Statewide Air Pollution Research C
University of California, Riverside
Riverside, California

University of California at Riverside.

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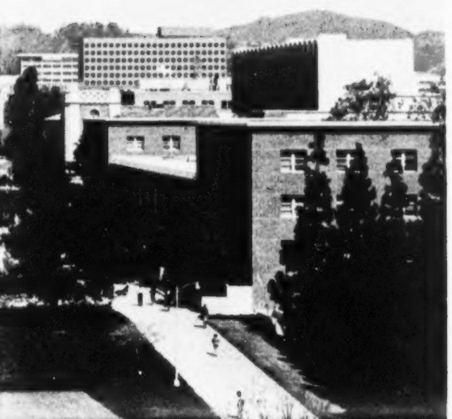

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Northeastern University at Boston.

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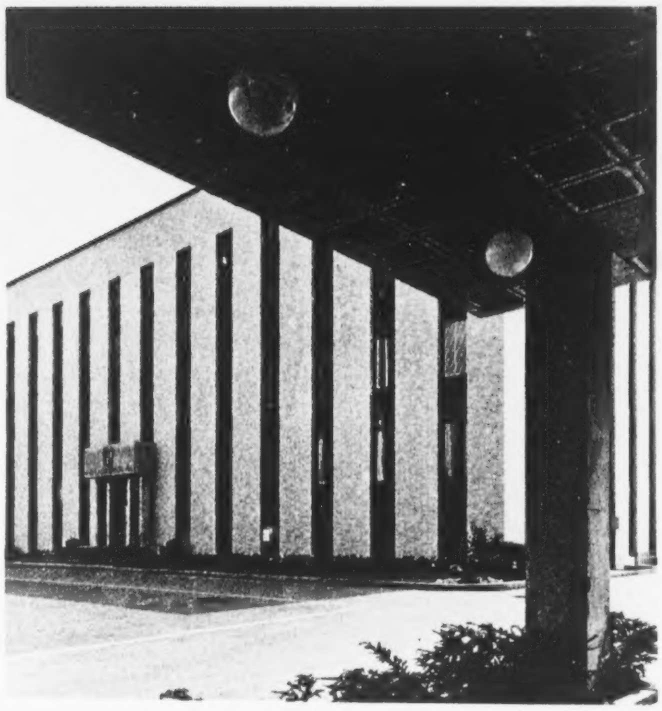
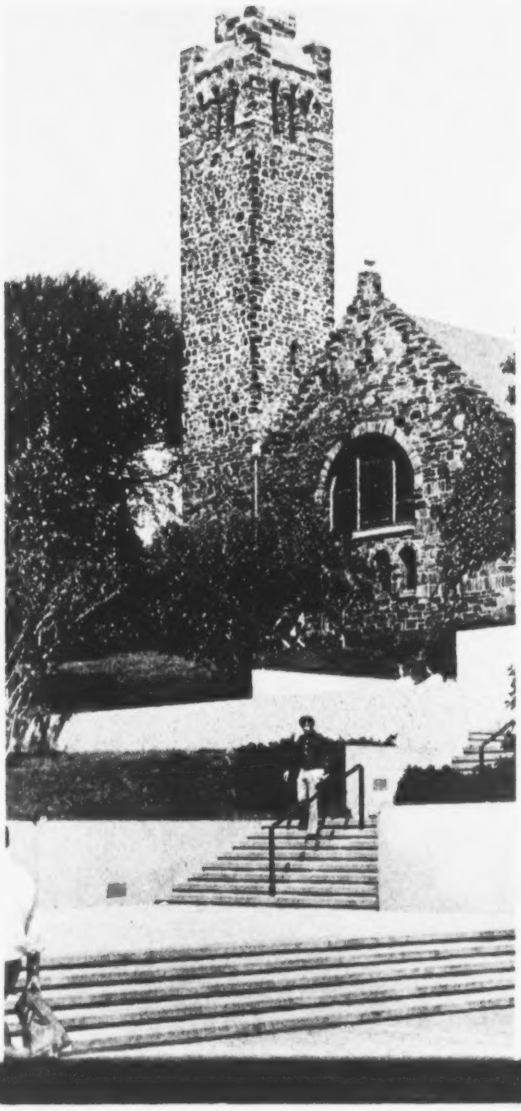


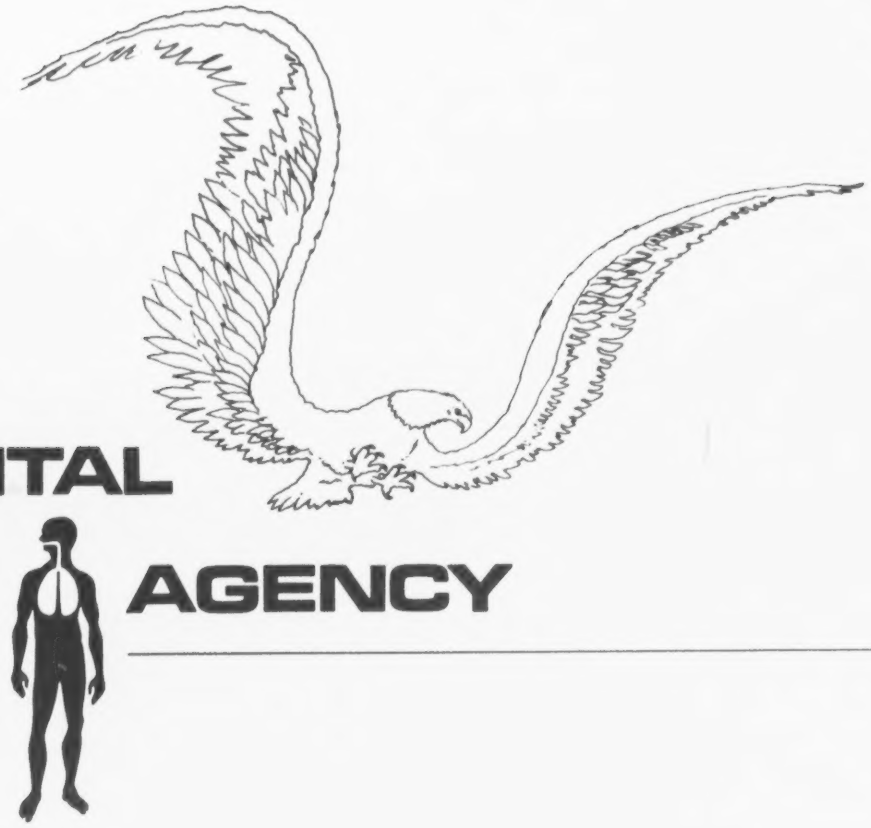
Northeastern University at Boston.

Lowell Technological Institute at Boston.



Tufts University at Medford, Massachusetts.

UNIVERSITY TRAINING PROGRAMS



ENVIRONMENTAL
PROTECTION AGENCY

UNIVERSITY TRAINING PROGRAMS

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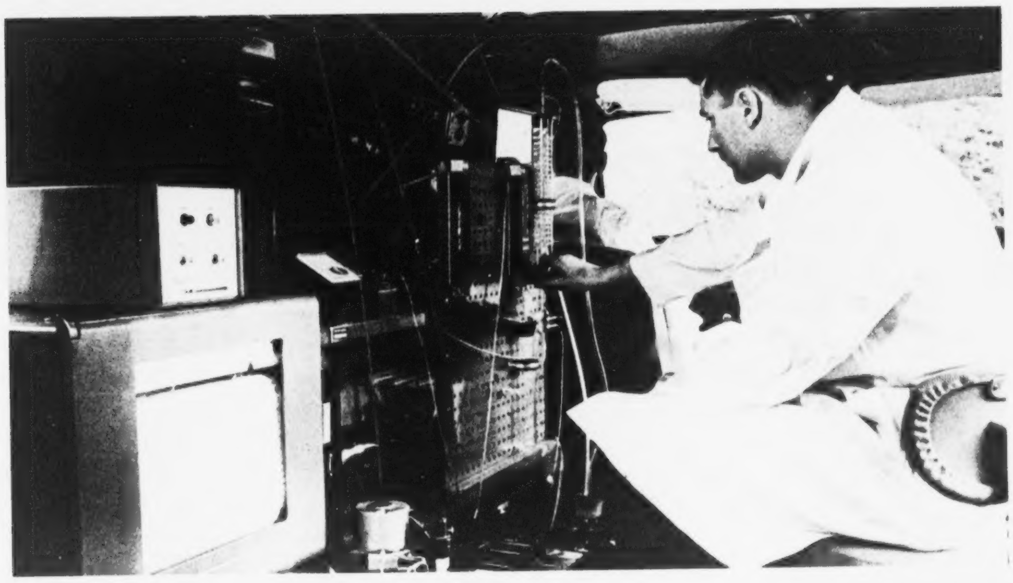
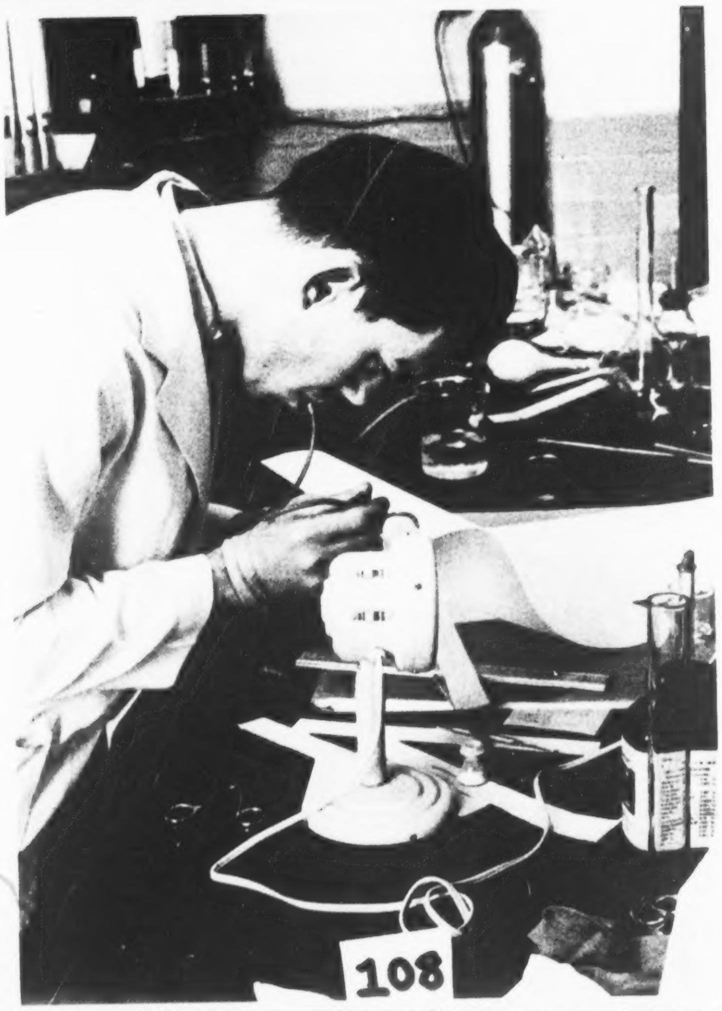
ENVIRONMENTAL PROTECTION AGENCY
Extramural Programs Branch
Research Triangle Park, North Carolina 27711
January 1971



Above:
The interior of one of the air pollution sampling trucks operated by researchers in the New York University School of Engineering and Science. NYU carries on approximately $2 million in air pollution-related research in medicine, engineering and science. It also operates graduate educational programs to train air pollution specialists in each of these fields.

Above right:
West Virginia University graduate students attend a Morgantown, West Virginia city council meeting to see how local legislators think and function. In air pollution control, the scientific facts alone are not enough—the health and economic implications of the facts have to be explained to the public and fitted into political-governmental realities.

Lower right:
Laboratory work at the University of Cincinnati.



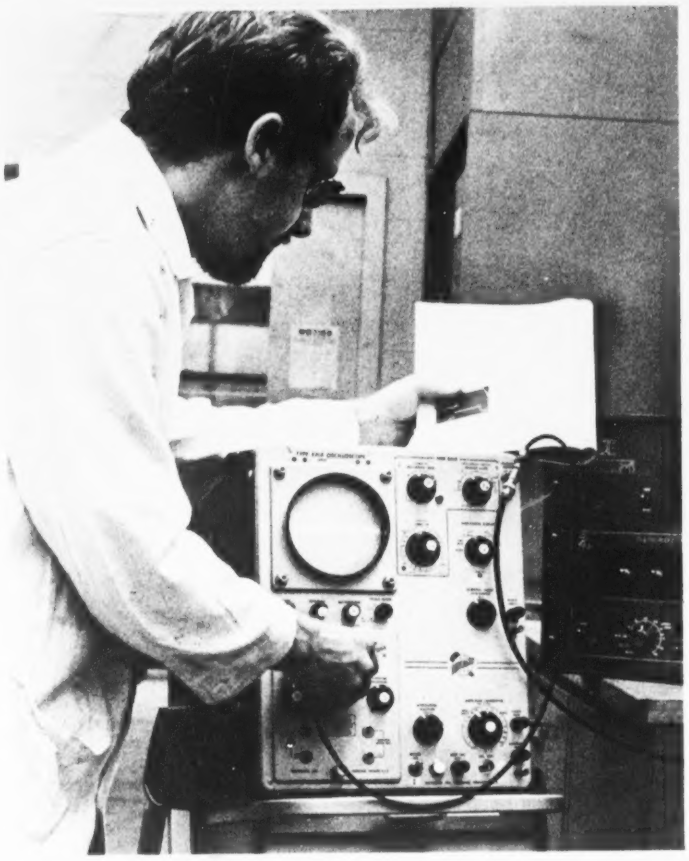
Introduction

The Clean Air Act, as amended and subsequent amendments make provision for the development of qualified air pollution control personnel.

The Office of Manpower Development, Office of Air Programs, which has prime responsibility for this task, develops training opportunities at recognized institutions throughout the country.

In addition, this office awards a limited number of fellowships to qualified scholars who wish to pursue graduate studies in air pollution control at a recognized institution of their choice.

This catalogue lists the institutions that offer graduate and specialist training programs supported by this office and describes briefly the purpose, content, and requirements of these programs and of the air pollution fellowship program.



Pulse characteristics being checked from a "hot wire" anemometer detector unit, for application to liquid aerosol studies.

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CAUTION
ATOMIC ABSORPTION UNIT

Aspirating a liquid sample into an Atomic Absorbtion Spectrophotometer. This unit determines trace metal concentrations in solution.

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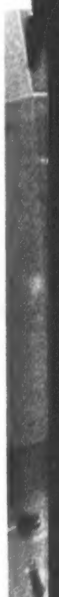
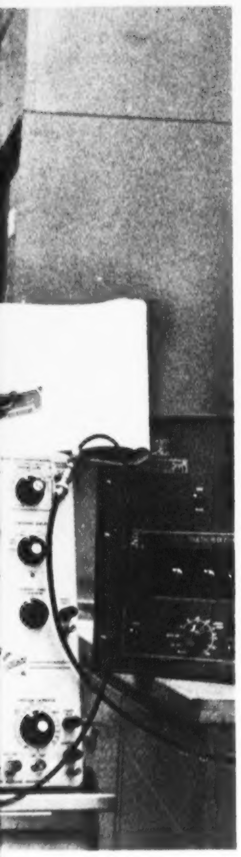


Divers making ready for a 200 foot dive in research submarine to observe stability of incinerator residue on ocean floor.

One phase of an overall program to evaluate respiratory responses to various dusts and for gases is the insertion of a guinea pig into a dust exposure chamber.



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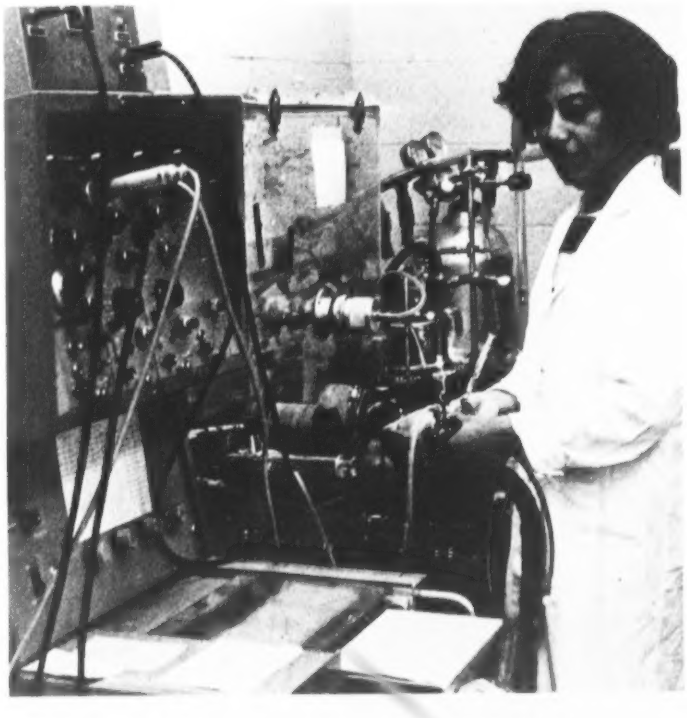
Aspirating a liquid sample into an Atomic Absorbtion Spectrophotometer. This unit determines trace metal concentrations in solution.

Body Plethysmograph measures flow resistance and compliance of lungs.



The purpose of the Graduate Training Pr
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of the Graduate Training Program

graduate level education for qualified students

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Graduat Training in Air Pol Control T

Graduate Training Programs in Air Pollution Control Technology

General Information:

Stipends are awarded for the support of persons engaged full-time in preparation for a career in the field of air pollution control.

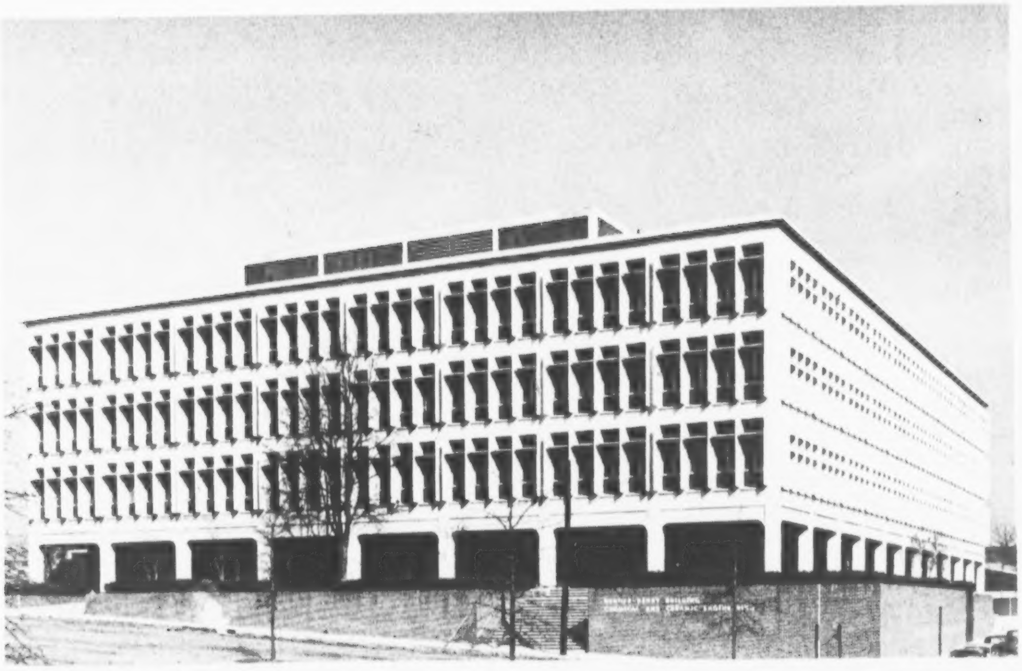
The university program director has complete responsibility for the selection of students, and for the allocation of funds thereto. To receive a stipend from a graduate training grant, the student must meet the following minimum eligibility requirements:

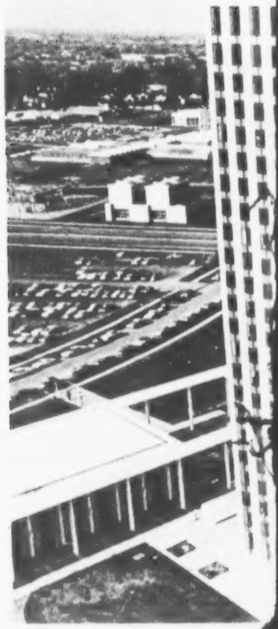
1. Possess at least a Bachelor's degree.

2. Meet the usual requirements of the graduate school of the grantee institution for admission as an advanced student, and be enrolled, or eligible for enrollment, as a regular full-time graduate student.

3. Be appointed on a full-time basis.

4. Be a citizen of the United States, or a non-citizen admitted to the United States for permanent residence. A non-citizen holding a temporary visa may be appointed with prior approval of the awarding unit.





(above) Chemical Engineering Building, at Georgia Institute of Technology. (above right) This tower and low-rise dormitories in the foreground are only one-half of the University of Kentucky's 22 million dollar residence hall complex. (below right) This new building complex at the University of Southern California includes (left to right): The Von Klein Smid Center for International and Public Affairs, Social Sciences building, and the Waite Phillips Hall of Education (below) Participants from Japan, Germany, Italy, United Kingdom and the Netherlands attend the UNC Symposium on "Multiple Source Urban Diffusion Modeling".

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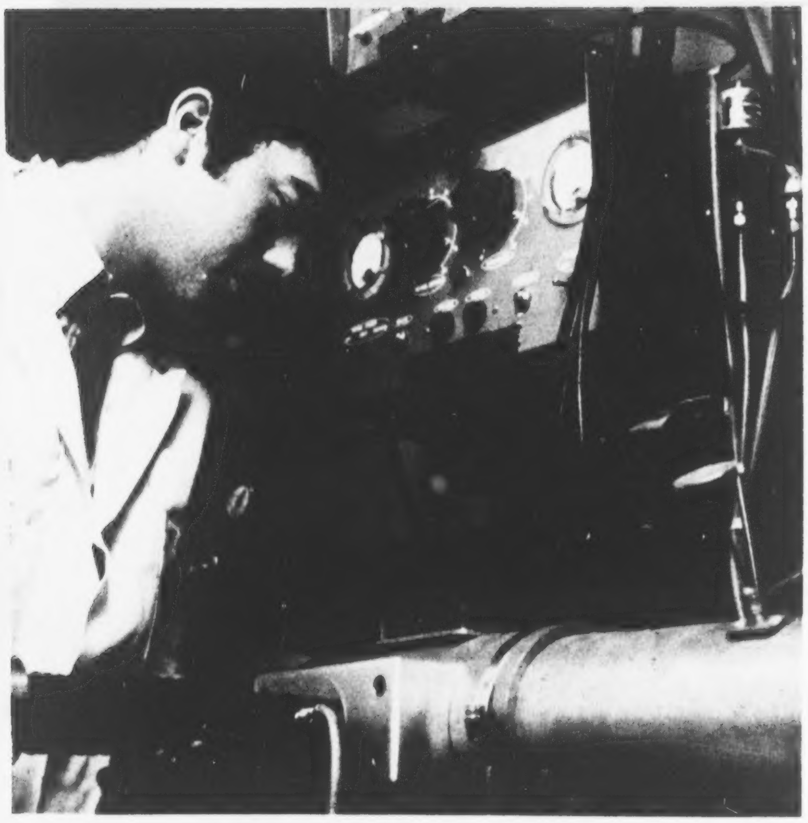

(above) West Virginia University graduate student is adjusting his self-machined nonconsumable electrode holder. This is part of a system he himself designed to produced large quantities of dry metal oxide particles for use in research on control equipment, respiratory disease, and vegetation injury.

Graduate Training Programs in Air Pollution Control Technology

(left) A Rutgers Ph.D. student studying the behavior of submicron particles.

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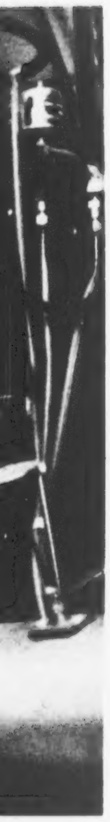

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Graduate Training Programs in Air Pollution Control Technology

(left) A Rutgers Ph.D. student studying the behavior of submicron particles.

University of Southern California

Los Angeles, California

The purpose of the training program in the School of Medicine is to provide two years of advanced training for M.D.'s in Applied Pulmonary Physiology and Pulmonary Diseases, with a foundation and orientation in the basic aspects of air pollution and its biological effects on health.

Trainees engage in independent research under supervision of a senior member of the faculty and attend weekly seminars and other clinical conferences, seminars, and lectures.

The training program has four segments:

1. Basic Atmospheric Sciences

The purpose of this segment is to provide formal training in depth in specific aspects of the total air pollution problem which are important for future pulmonary physician-physiologists.

2. Thoracic Medicine

The purpose of this segment, covering a 6-month period is to provide intensive and realistic experience in the management of patients with pulmonary disease and an understanding of the natural history, pathophysiology, and social and environmental factors related to respiratory diseases.

3. Pulmonary Physiology

During this 1-year period, trainees receive detailed instruction concerning ventilatory function, respiratory gas exchange, and applied physiology of exercise.

4. Independent Study and Research

During the final six months, each trainee is encouraged to select a problem in the field of pulmonary physiology, pathology, or disease with or without relevance to air pollution and to pursue it in depth.

For additional information write to the Program Director: Dr. Clayton G. Loosli, Hasting Professor of Medicine, School of Medicine, University of Southern California, 2025 Zonal Avenue, Los Angeles, California 90033.

University of Florida
Gainesville, Florida

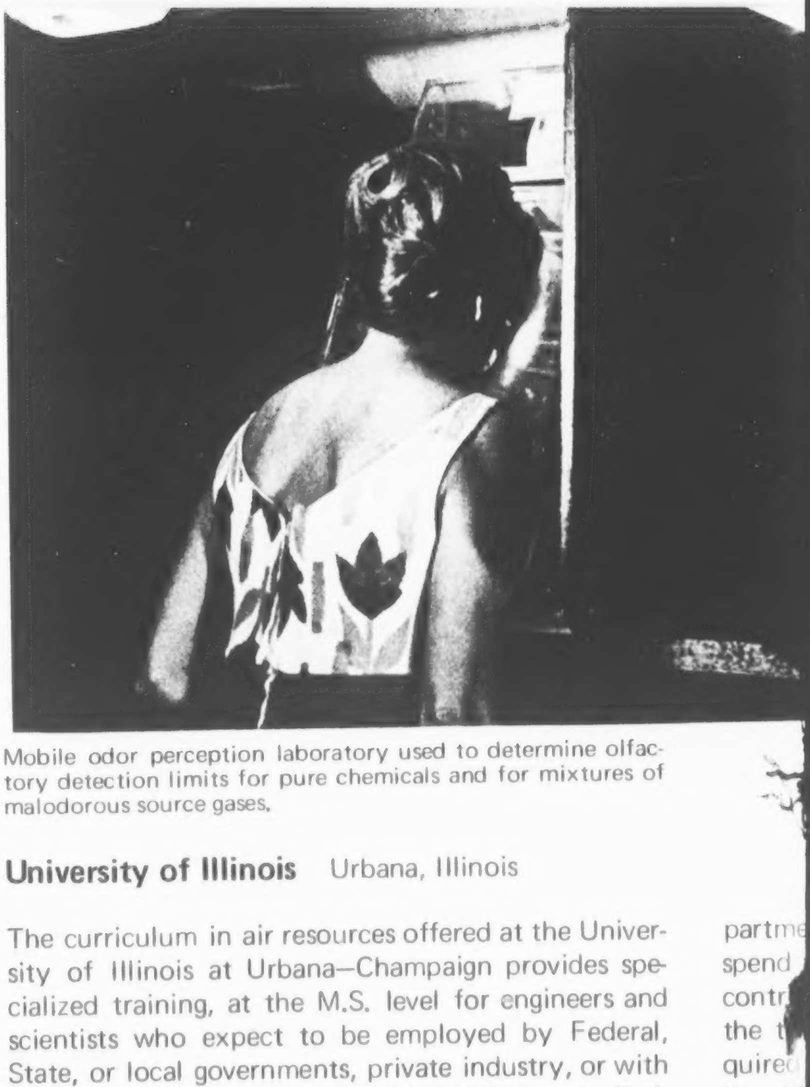
The purpose of this program offered by the Department of Environmental Engineering is to provide advanced, specialized education for graduate engineers and scientists in air pollution control. The program is arranged individually for each student. In addition to specialized air pollution studies the student acquires a knowledge of the broad aspects of environmental engineering and an understanding of the principles and problems of related disciplines. To achieve this all students are required to participate in a departmental core program. Degree programs include the Doctor of Philosophy and the thesis and non-thesis Masters.

Ph.D. candidates attend the entire series of air pollution courses and do additional work in environmental engineering to complete the major portion of their program. In addition to his major, the student may select a minor in another discipline; however, this is not required in any of the degree programs. A dissertation based on original research is required.

Air pollution related courses offered in this program include:

- Man and His Environment
- Occupational Health
- Atmospheric Pollution
- Environmental Instrumentation
- Air Pollution Sampling and Analysis
- Air Pollution Control
- Meteorology
- Environmental Micrometeorology

For additional information write to Program Director: Dr. Robert S. Sholtes, Air Pollution Research Laboratories, Department of Environmental Engineering, University of Florida, Gainesville, Florida 32601.



Mobile odor perception laboratory used to determine olfactory detection limits for pure chemicals and for mixtures of malodorous source gases.

University of Illinois Urbana, Illinois

The curriculum in air resources offered at the University of Illinois at Urbana–Champaign provides specialized training, at the M.S. level for engineers and scientists who expect to be employed by Federal, State, or local governments, private industry, or with consulting firms involved in identifying and eliminating air pollution problems. The course offerings are also available to students in other academic programs. Supporting the course offerings is an active research effort related to air pollution problems. Studies that lead to a Ph.D. degree including course work and research work are also available.

Although the program involves primarily the Departments of Civil and Mechanical Engineering, the program is open to all engineering students as well as to chemistry and physics majors.

The M.S. program can be completed in 12 months and includes a thesis or special problem (depending upon the requirements of the candidate's major de-

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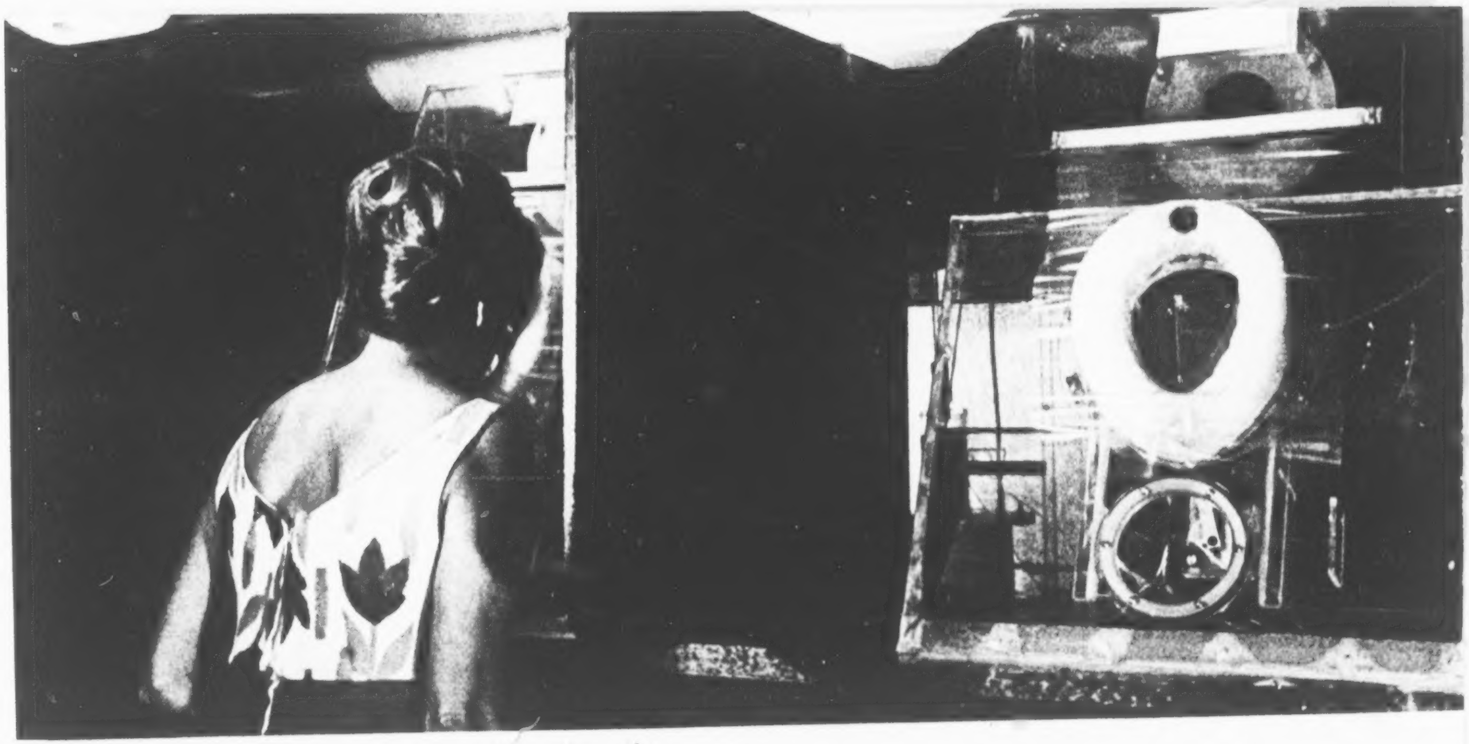

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Although the program involves primarily the Departments of Civil and Mechanical Engineering, the program is open to all engineering students as well as to chemistry and physics majors.

The M.S. program can be completed in 12 months and includes a thesis or special problem (depending upon the requirements of the candidate's major department). In addition, each candidate is required to spend from two to four weeks in a State or local control agency for on-the-job experience as part of the twelve-month M.S. program. All students are required to be knowledgeable of the subject matter listed below. A wide variety of supplemental courses is available in air resources as well as in other environmental areas.

Principles of Air and Water Chemistry
Engineering Applications of
Meteorological Fundamentals
Air Pollution Seminar
Air Resources Management
Control of Air Pollution
Analysis of Air Pollutants
Biology of Environmental Systems

For additional information, write to the Program Director: Dr. James J. Stukel, Assistant Professor of Mechanical and Civil Engineering, University of Illinois, Urbana, Illinois 61801.

University of Kentucky Lexington, Kentucky

The objective of the Graduate Program in Air Pollution Control offered in the College of Engineering is to provide academic and research training leading to the M.S. and Ph.D. degrees. Engineers will be prepared to participate in virtually all phases of activities of Federal, State, and municipal agencies, health departments, and industrial or research establishments involved in the prevention and abatement of atmospheric pollution.

The requirements for the M.S. degree, which can be completed in 12 months, are: five 3–semester–hour core courses, three 3–hour courses selected from optional courses or from suitable elective courses, and an M.S. thesis that in certain cases, can be replaced by two additional courses. A seminar is scheduled one afternoon every 2 weeks to acquaint trainees with the latest developments in the field. M.S. degrees are awarded in chemical engineering, civil engineering, and mechanical engineering. Students with B.S. degrees in chemistry or physics are also eligible for the program.

Air pollution related courses offered in this program include:

Fundamentals I: Atmospheric chemistry
and thermodynamics, micro-meteorological
concepts, and turbulent diffusion.

Fundamentals II: Source control, gaseous
and particulate pollutant separation,
legal and administrative aspects.

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Harvard University Cambridge, Massachusetts

The air pollution training program is offered by the staff of the Kresge Center for Environmental Health. This center is composed of the Departments of Environmental Health Sciences, Physiology, and Sanitary Engineering. Fundamental and applied research on the biological, physical, and chemical aspects of air pollution control play a major role in the activities of the center, and this is reflected in the training program. Through the cooperation of other Graduate Schools within the University, related courses are available on the planning, administrative and economic aspects of the subject.

Individuals specializing in air pollution control may pursue a program leading to the degrees of Master or Doctor of Science in Hygiene. Students receive intensive training in air pollution control, supplemented by a broad background in environmental health, including industrial hygiene, radiological health, and toxicology.

Since experience has shown that protection of the air environment requires trained personnel in a variety of basic disciplines, this program encourages the participation of engineers, physicians, and students holding degrees in chemistry, physics, mathematics, biology and pharmacy.

Harvard offers the following courses:

Community Air Pollution
Meteorological Aspects of Air Pollution
Instrumental Methods of
Environmental Analysis
Identification and Measurement
of Air Contaminants

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Biostatistic

Basic Probl
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Human Ph
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Further info
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scheduled one afternoon every 2 weeks to acquaint trainees with the latest developments in the field. M.S. degrees are awarded in chemical engineering, civil engineering, and mechanical engineering. Students with B.S. degrees in chemistry or physics are also eligible for the program.

Air pollution related courses offered in this program include:

Fundamentals I: Atmospheric chemistry and thermodynamics, micro-meteorological concepts, and turbulent diffusion.

Fundamentals II: Source control, gaseous and particulate pollutant separation, legal and administrative aspects.

Engineering and Economics: Combustion principles, fuels, and emission and field sampling.

Air Sampling and Analysis: Statistics of sampling, analytical procedures, and laboratory determinations.

Public Health Aspects: Epidemiology and toxicology, effects on the environment, and solid waste disposal and water pollution interrelation.

For additional information, write to the Program Director: Dr. Robert B. Grieves, Professor and Chairman of Chemical Engineering, University of Kentucky, Lexington, Kentucky 40506.

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health, including industrial hygiene, radiological health, and toxicology.

Since experience has shown that protection of the air environment requires trained personnel in a variety of basic disciplines, this program encourages the participation of engineers, physicians, and students holding degrees in chemistry, physics, mathematics, biology and pharmacy.

Harvard offers the following courses:

Community Air Pollution
Meteorological Aspects of Air Pollution
Instrumental Methods of
Environmental Analysis
Identification and Measurement
of Air Contaminants
Aerosol Technology
Biostatistics and Epidemiology

Basic Problems in Occupational Health
and Industrial Environments
Human Physiology
Principles of Toxicology
Environmental Control
Legal Aspects of Consumer and
Environmental Protection
Mathematical Modeling for Health Sciences
Operations Research in
Environmental Health Engineering

Further information may be obtained by contacting: Dr. Dade W. Moeller, Associate Director, Kresge Center for Environmental Health, Harvard School of Public Health, 665 Huntington Avenue, Boston, Massachusetts 02115.

Chrysler Center for Continuing Engineering Education, University of Michigan.

Institute of Science and Technology at the University of Michigan.

Physics and Astronomy buildings at the University of Michigan.

A pioneering air pollution wind tunnel
of Engineering and Science. Elaborate
solved scores of atmospheric pollution
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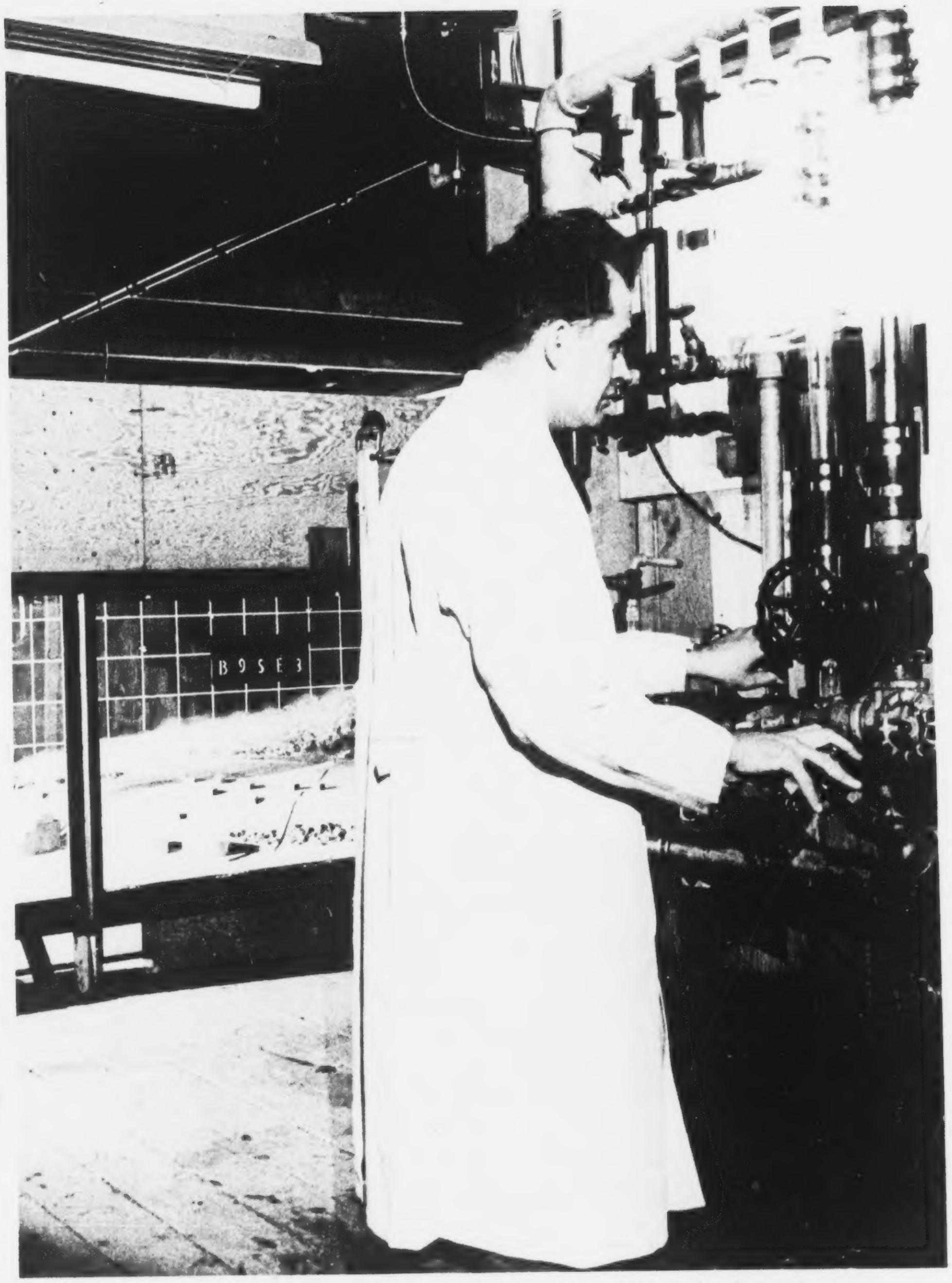
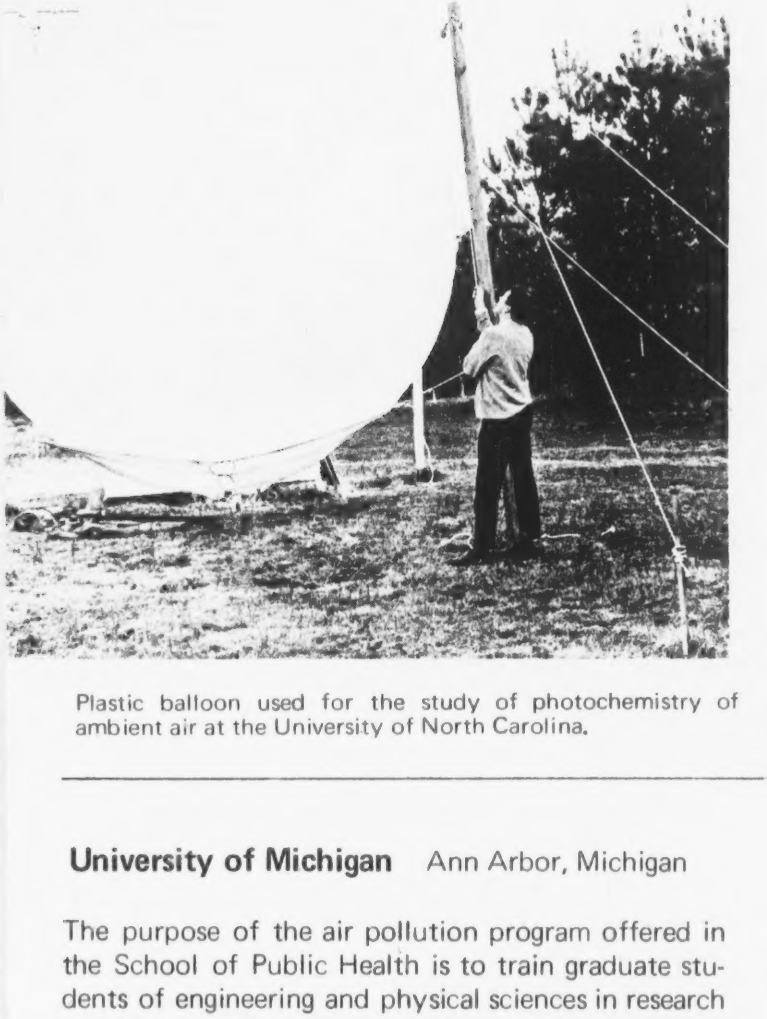


A pioneering air pollution wind tunnel at the New York University School of Engineering and Science. Elaborate scale model tests in this tunnel have solved scores of atmospheric pollution problems and led to advances in pollution research and control technology.



Plastic balloon used for the study of photochemistry of ambient air at the University of North Carolina.

University of North Carolina   Chapel Hill, North Carolina

Air pollution training at the University of North Carolina at Chapel Hill is in the Air and Industrial Hygiene Program of the Department of Environmental Sciences and Engineering of the School of Public Health. The Department has a regular faculty of 30 and an enrollment of over 100 students; additionally, programs are offered in Sanitary Engineering and Water Resources, Environmental Chemistry and Biology, Environmental Management and Protection, and Radiological Hygiene.

The Air and Industrial Hygiene Program is now in its twelfth year. It offers courses in both air pollution and industrial hygiene, leading to the Ph.D., M.S.,

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University of Michigan   Ann Arbor, Michigan

The purpose of the air pollution program offered in the School of Public Health is to train graduate students of engineering and physical sciences in research and in the development of air pollution control methods and to increase the number of air-pollution-oriented scientists available to government and industry.

Graduate degree candidates in the Departments of Engineering and Meteorology as well as in the School of Public Health are eligible to participate in the interdepartmental air pollution training program. All participants study the four core courses listed below.

All Master's degree candidates attend an interdepartmental seminar for two semesters. Ph.D. candidates are required to attend a total of four semesters and to present a report on their research and thesis project.

Air pollution related courses offered in this program include:

- Combustion and Air Pollution Control
- Health Factors in Air Pollution
- Interdisciplinary Seminar in Air Pollution
- Air Pollution Meteorology

Two additional courses are required of Ph.D. candidates and Master's candidates in the air pollution program for more than one year:

- Analysis of Air Pollutants
- Advanced Seminars in Air Pollution

For additional information write to the Program Director: Bertram D. Dinman, M.D., Dept. of Environmental and Industrial Health, School of Public Health, University of Michigan, Ann Arbor, Michigan 48104.

Air pollution related courses offered in this program include:

- Combustion and Air Pollution Control
- Health Factors in Air Pollution
- Interdisciplinary Seminar in Air Pollution
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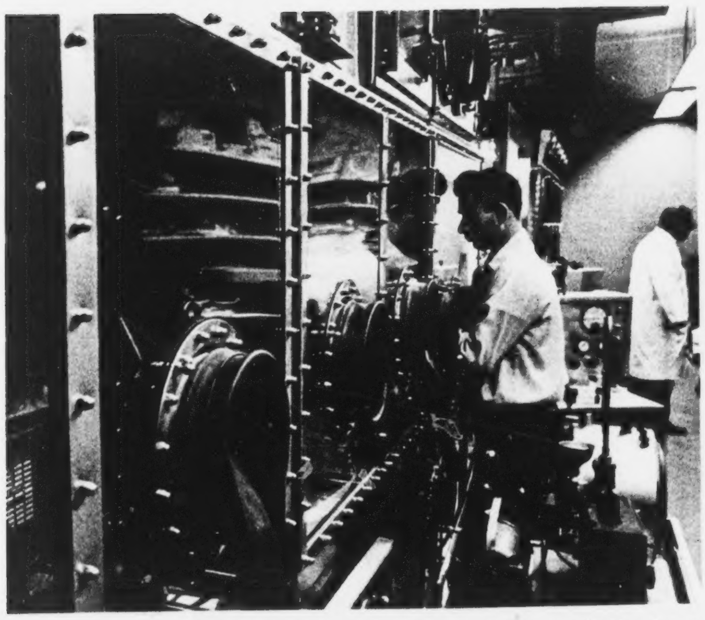
The Air and Industrial Hygiene Program is now in its twelfth year. It offers courses in both air pollution and industrial hygiene, leading to the Ph.D., M.S., M.S.P.H. and M.S.E.E. (Environmental Engineering) degrees. The Program had a 1970 enrollment of 21 graduate students and a regular faculty of five professors. Masters degree students may elect a one-year general air pollution program, or a two-year receptor, source, or system-oriented program. The receptor-oriented program emphasizes air pollution measurement, transport, and effects, and stresses courses in the biological and physical sciences. The source-oriented program emphasizes air pollution sources and their engineering and legal control, and stresses courses in engineering. The system-oriented program looks at the entire air pollution system and stresses courses in city and regional planning, social sciences, and systems analysis.

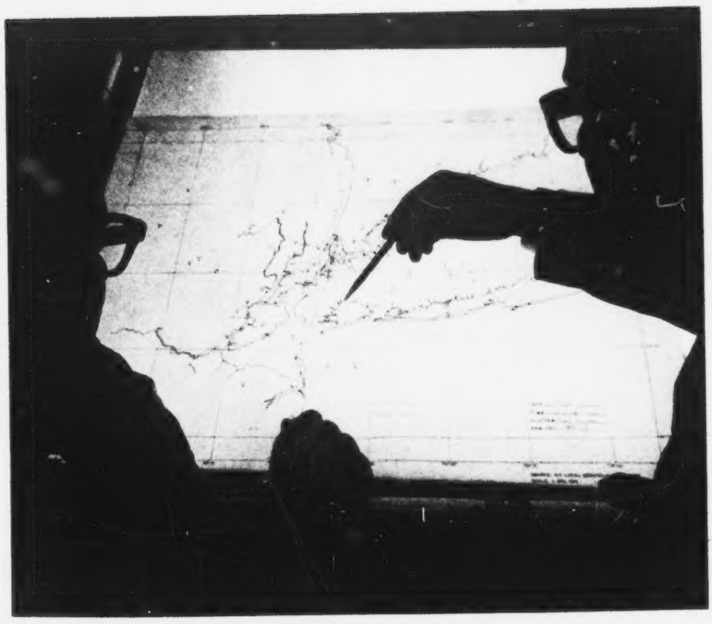
The Chapel Hill campus is 15 minutes from Research Triangle Park, which contains the Office of Air Programs Technical Center, the National Institute of Environmental Health Sciences, and the Research Triangle Institute.

The University of North Carolina at Chapel Hill is a member of the Triangle Universities Consortium on Air Pollution, the other members are Duke University at Durham and North Carolina State University at Raleigh. Students in the Air and Industrial Hygiene Program at Chapel Hill may take courses at Duke and N.C.S.U.; as well as those jointly offered by the Consortium.

For detailed curricula and additional information, write to: Professor Arthur C. Stern, Department of Environmental Sciences and Engineering, School of Public Health, University of North Carolina, Chapel Hill, North Carolina 27514.

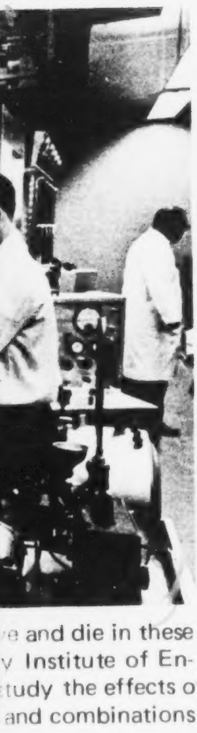


Generations of laboratory animals are born, live and die in these isolation chambers at the New York University Institute of Environmental Medicine, enabling researchers to study the effects of long term, low-level exposure to various types and combinations of air pollutants.



Graduate students in meteorology at the New York University School of Engineering and Science study the recorded trajectories of "tetroons", constant-altitude balloons flown over New York City in a New York University-United States Weather Bureau study of how air circulation patterns influence the movement, dispersion, and mixing of air pollutants over the Metropolitan area.

University of North Carolina professor demonstrating auxiliary equipment to graduate students.



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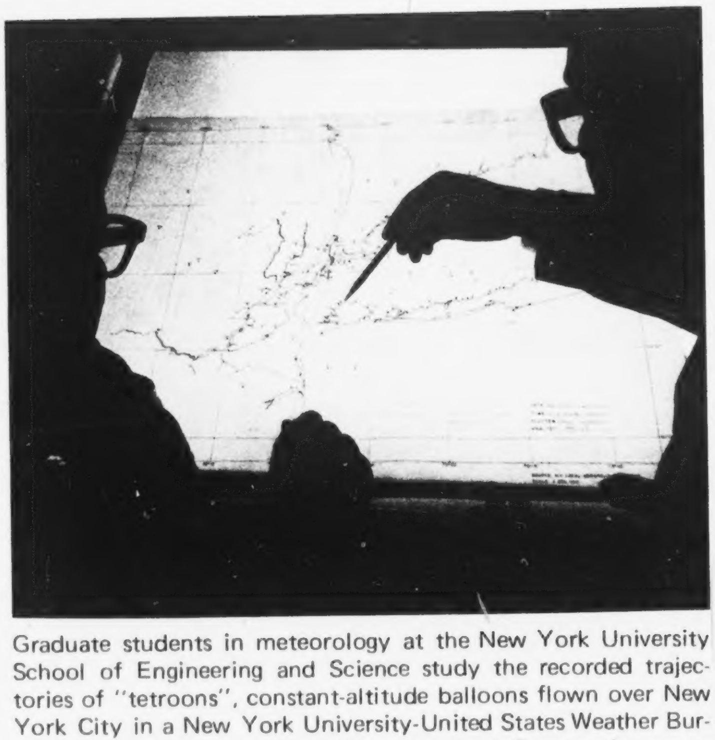

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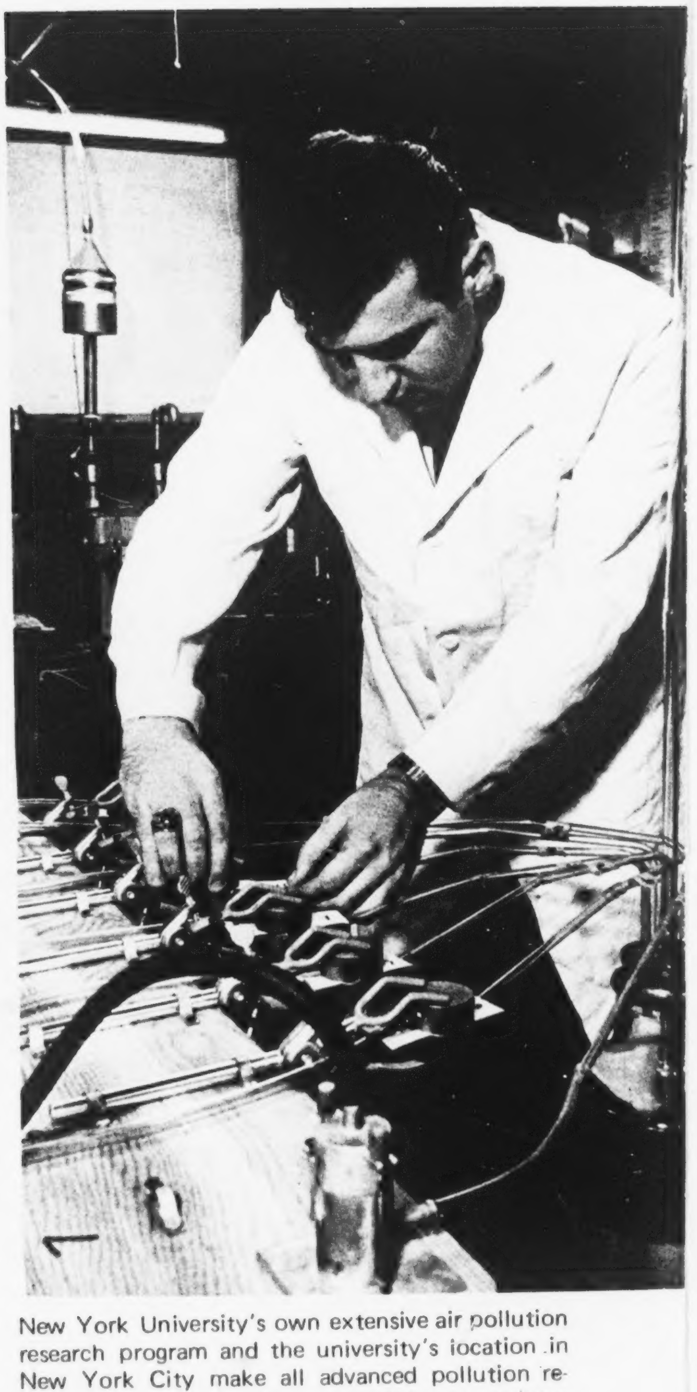
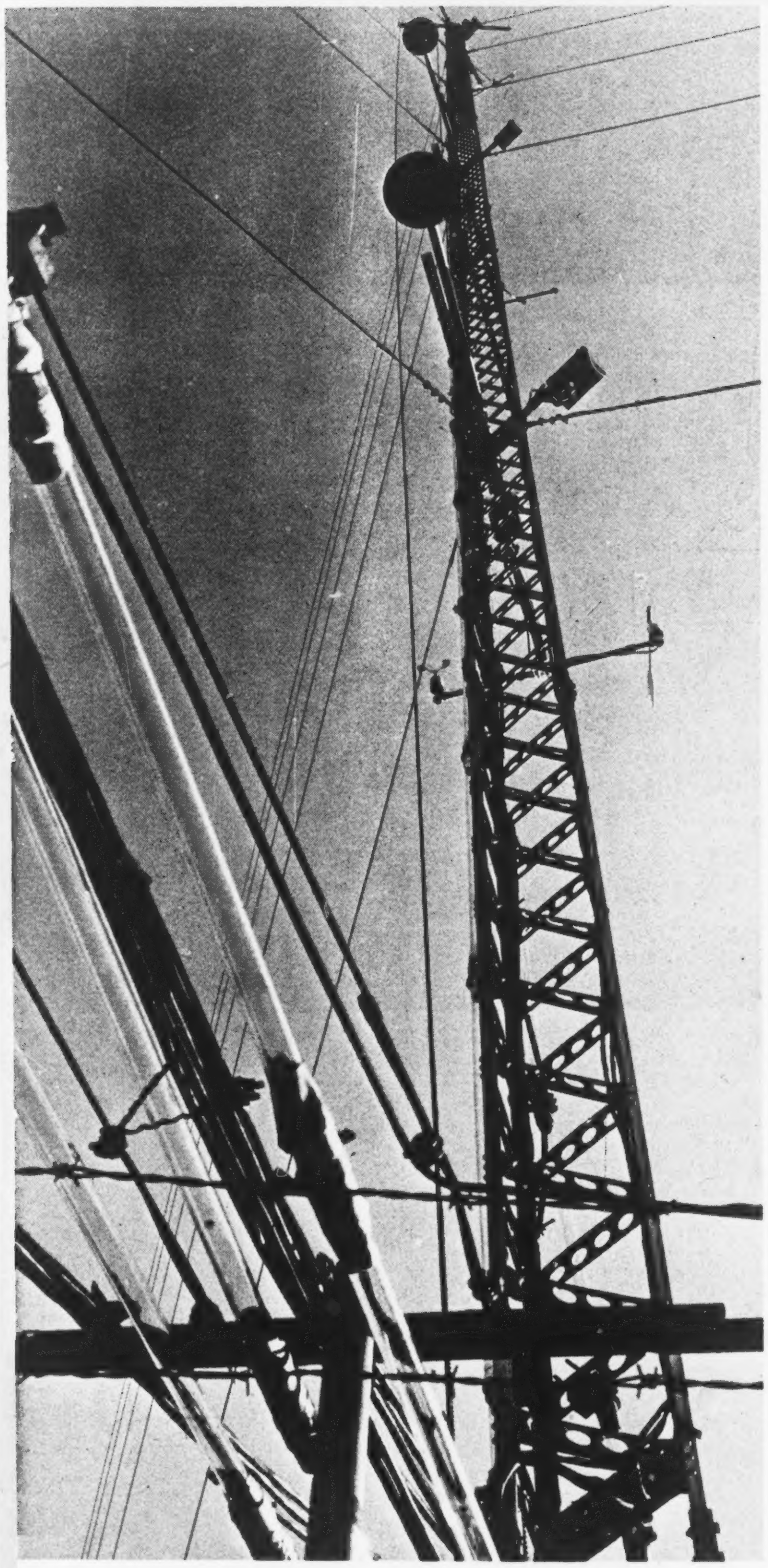


New York University's own extensive air pollution research program and the university's location in New York City make all advanced pollution research and control equipment available to graduate students in the NYU Air Resources Training Program.



Tower, at the University of North Carolina, instrumented for meteorological measurements and collection of air samples.

New York University New York, New York

The purpose of this program is to offer graduate students a coordinated interdepartmental program leading to the M.S. degree in either civil engineering, chemical engineering, or meteorology with a strong common minor in the field of air pollution. In this way it is intended not only to train students to participate in air pollution control and research programs, but also to increase their technical competence in the field of individual specialization.

The training course covers a full calendar year. Formal course work is taken in the fall and spring semester; the summer is devoted to thesis research or to participation in an existing on-campus research project and the writing of a research paper.

All students are required to take the five courses listed below. The total requirement for the Master's degree is 36 units. Additional course electives, including research thesis or other departmental requisites for the degree, comprise the balance. The degree is

Oregon State University Corvallis, Oregon

This program provides academic and research training for the M.S. and Ph.D. degrees to prepare engineers and scientists for professional careers in atmospheric pollution control in public and private agencies and industries concerned with solving air pollution problems.

Requirements for the M.S. degree are 30 hours in the major field and 15 hours in the minor. For the Ph.D. degree, approximately 135 hours are required, of which 80 are in the major and 30 to 50 are allotted to the thesis.

Individual programs are adjusted to fit the student's interests and needs.

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New York University New York, New York

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All students are required to take the five courses listed below. The total requirement for the Master's degree is 36 units. Additional course electives, including research thesis or other departmental requisites for the degree, comprise the balance. The degree is granted by the Department which has academic jurisdiction over the student.

Air pollution related courses offered in this program include:

Air Pollution Analysis
Air Pollution Chemistry
Microclimate and Dispersion of Pollutants
Environmental Health Engineering-Air Pollution Engineering Control
Air Pollution Effects

Additional related courses are available in the Department of Aeronautics and Astronautics and the School of Environmental Medicine.

For additional information write to Program Director: Dr. James P. Friend, Associate Professor, Department of Meteorology and Oceanography, New York University, Bronx, New York 10453.

Oregon State University Corvallis, Oregon

This program provides academic and research training for the M.S. and Ph.D. degrees to prepare engineers and scientists for professional careers in atmospheric pollution control in public and private agencies and industries concerned with solving air pollution problems.

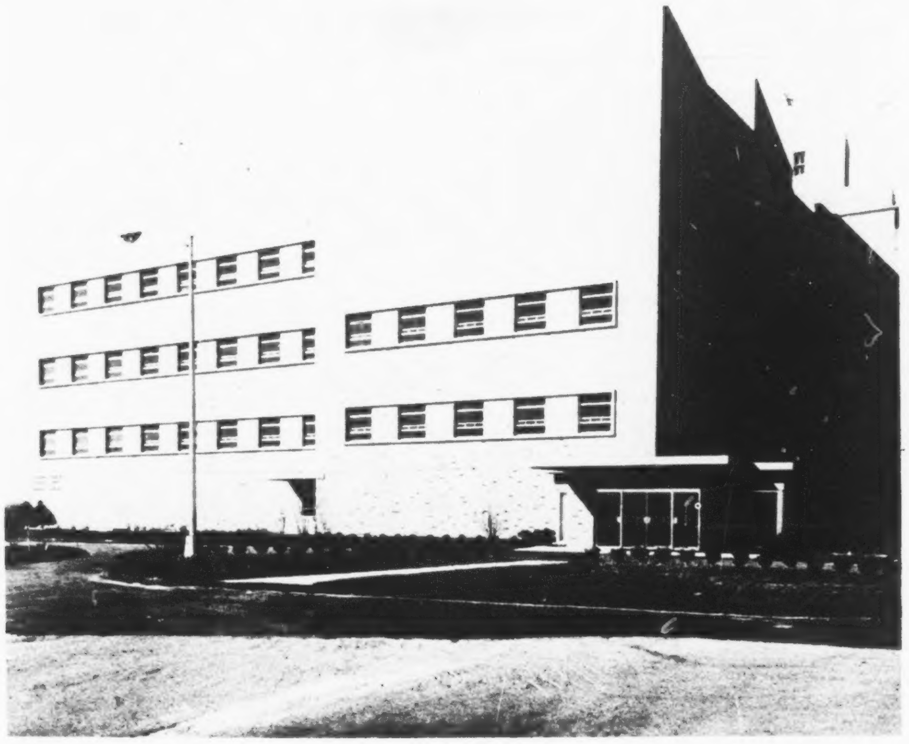
Requirements for the M.S. degree are 30 hours in the major field and 15 hours in the minor. For the Ph.D. degree, approximately 135 hours are required, of which 80 are in the major and 30 to 50 are allotted to the thesis.

Individual programs are adjusted to fit the student's interests and needs.

Air pollution related courses offered in this program include:

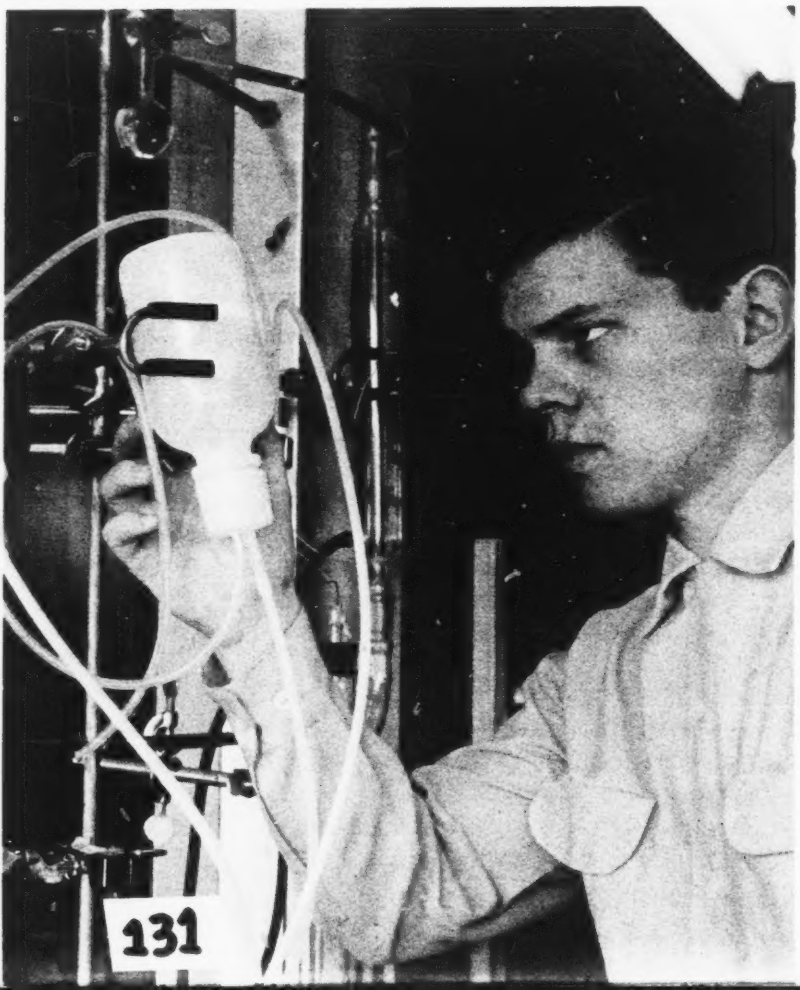
Fundamentals of Air Sanitation
Measurement and Control of Air Pollutants
Industrial Hygiene
Seminar on Atmospheric Environment
Thesis

For additional information write to the Program Director: Dr. Richard W. Boubel, Professor of Mechanical Engineering, Oregon State University, Corvallis, Oregon 97331.



(right) Kettering Laboratory at University of Cincinnati Institute of Environmental Health.

(below left) A laboratory study at the University of Minnesota



The University of Minnesota at Minneapolis

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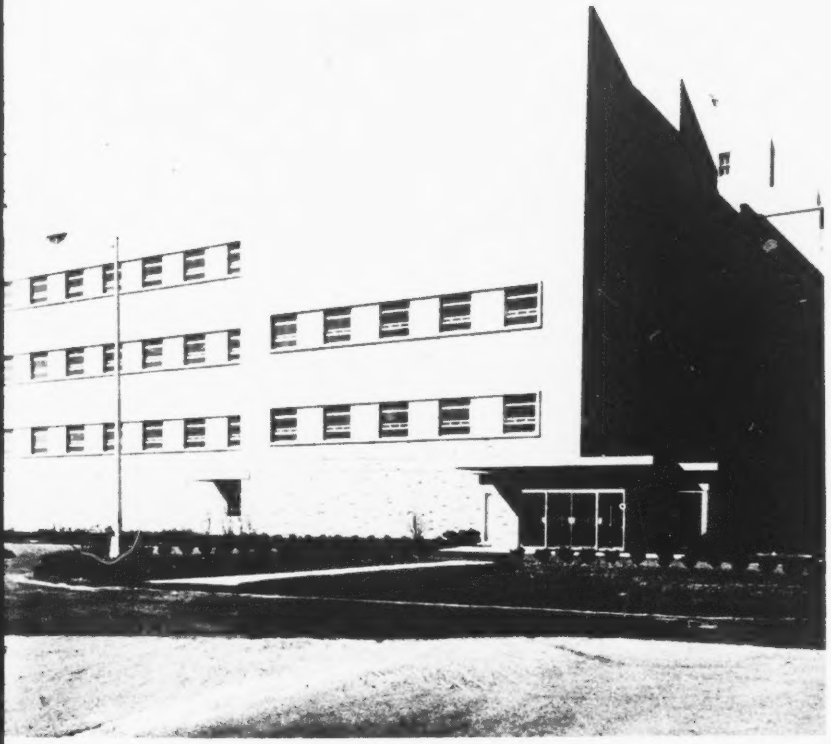

The University of Minnesota at Minneapolis

Physics project in laboratory at Drexel University.

Meteorological equipment used in field study at Drexel University.

University of Cincinnati Cincinnati, Ohio

The University of Cincinnati offers a graduate training program in air pollution within two departments with the objective of providing a broad base of essential fundamental principles, a depth of knowledge in specialized fields, and research training under the guidance of experienced scientists and engineers. The student may elect to take his degree program in either the College of Medicine, Department of Environmental Health, or the College of Engineering, Division of Environmental Health Engineering. Under the auspices of the interdepartmental Center for the Study of the Human Environment, students receive the opportunity to participate in other programs such as Chemical Engineering, Water Pollution, Solid Waste Engineering, Chemistry, Community Planning, Geography. Different programs are available leading to the degrees of M.S. or Ph.D.

Available at the Department of Environmental Health are well-equipped laboratories for teaching and research in measuring and monitoring pollutants, toxicology, biological sciences, and environmental medicine, as well as library and computer facilities. Available at the Division of Environmental Health Engineering are chemical, microbiological, and pilot plant laboratories. New facilities include air pollution control laboratories.

Air Pollution related courses offered in this program include:

Air Pollution Chemistry
Air Pollution Control Methods
Community Air Pollution Control
Air Sampling and Analysis I, II
Automotive Air Pollution and Control
Biological Effects of Air Pollutants
Design of Air Pollution Control Systems
Instrumental Methods of Analysis
  of Air Pollutants
Design of Environmental Quality
  Monitoring Programs

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University of Minnesota Minneapolis, Minnesota

The Air Pollution Control Training Program of the Environmental Health Section of the School of Public Health has the following aims: (1) to increase the number of competent, well-trained engineers, chemists, and other scientists available for research and training in the technical aspects of air pollution and air pollution control; (2) to prepare selected individuals for service in air pollution control programs; (3) to indoctrinate students of different disciplines and from different departments of the university with the problems of air pollution in community life.

A candidate for the M.S. or M.P.H. degree in environmental health, with specialization in air pollution control, attends the core curriculum and elective courses suitable for his academic background.

The candidates for the Ph.D. degree are selected individuals who possess a suitable science background. In a minimum 3-year program, the trainee majors in environmental health and selects a minor program related to his previous academic training.

Air pollution related courses offered in this program include:

Elements of Public Health
Environmental Health
Epidemiology
Public Health Administration
Biometry
Environmental Biology
Environmental Health Seminar

Specialty courses offered for the M.S. or M.P.H. degree are:

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Air Pollution related courses offered in this program include:

Air Pollution Chemistry
Air Pollution Control Methods
Community Air Pollution Control
Air Sampling and Analysis I, II
Automotive Air Pollution and Control
Biological Effects of Air Pollutants
Design of Air Pollution Control Systems
Instrumental Methods of Analysis
  of Air Pollutants
Design of Environmental Quality
  Monitoring Programs
Air Pollution Meteorology
Environmental Health Seminar
Environmental Health and Community Planning
Environmental Hygiene Technology
Environmental Sanitation
Epidemiology
Fuels and Fuel Technology
Industrial Ventilation
Introduction to Biostatistics
Introduction to Toxicology
Physiology and Biological Chemistry
Experimental Design
Small Particle Technology
Toxicologic Aspects of the Environment

For additional information, write to: Professor Bernard E. Saltzman, Department of Environmental Health, University of Cincinnati, Cincinnati, Ohio 45219; or to Professor John N. Pattison, Division of Environmental Health Engineering, University of Cincinnati, Cincinnati, Ohio 45221.

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Air pollution related courses offered in this program include:

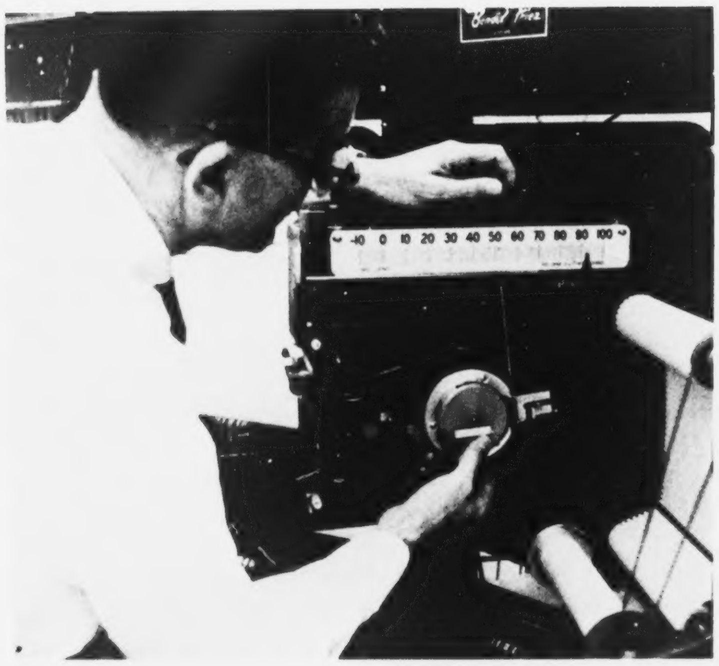
Elements of Public Health
Environmental Health
Epidemiology
Public Health Administration
Biometry
Environmental Biology
Environmental Health Seminar

Specialty courses offered for the M.S. or M.P.H. degree are:

Air Pollution Control
Introduction to the Air Pollution Problem
Air Analysis
Air Pollution Projects
Topics in Air Pollution Control
Industrial Hygiene Engineering
Particle Technology
Air Pollution Meteorology

The curriculum for the Doctoral degree is designed to accommodate the academic background and desire of each student. Courses are available in all departments of the university.

For additional information, write to the Program Director: Dean Lee Stauffer or Professor Harold Paulus, School of Public Health, University of Minnesota, Minneapolis, Minnesota 55455.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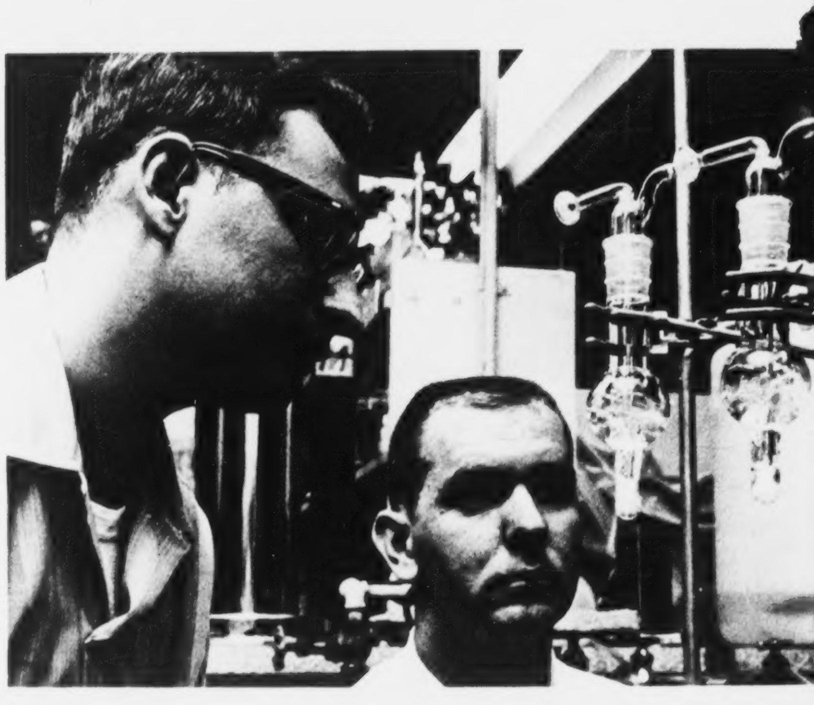
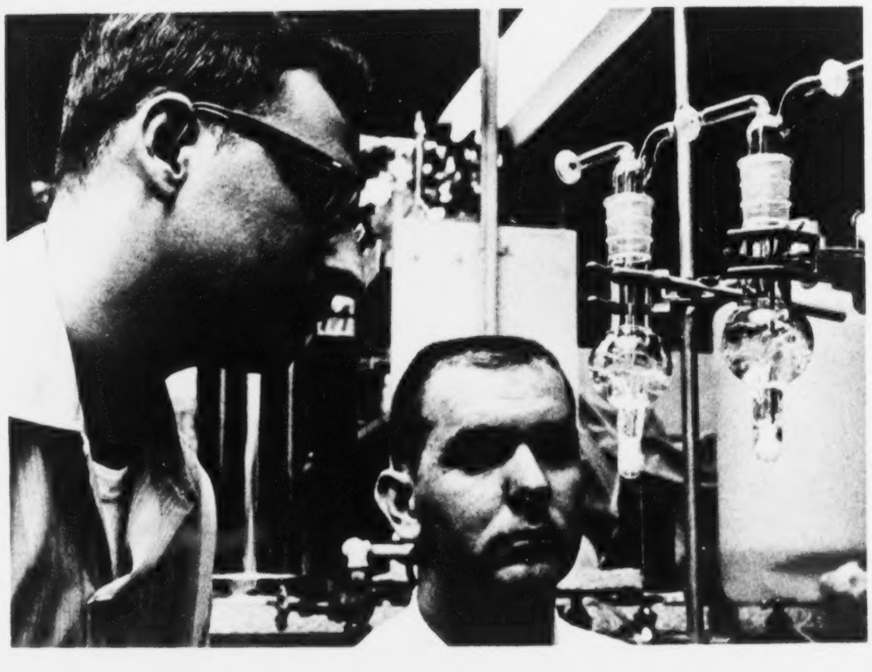
Drexel University meteorologist

Laboratory study at Drexel University



Instructor, right, demonstrates apparatus for study of air pollution to two students in training program for air pollution technicians operated by the Pennsylvania State University.



Smog Bubbler apparatus, used for air pollution studies, is checked by two students participating in training program at The Pennsylvania State University Center for Air Environment Studies.

The University of Texas at Austin Austin, Texas

The graduate program in air pollution control is designed to provide the student with the highest quality of engineering, scientific, and technological education. The objective of this program is to provide a basis for the individual student to understand, identify, and develop practical solutions to the engineering-related problems associated with the prevention and abatement of atmospheric pollution. Graduate studies in air pollution control at The University of Texas are part of the Environmental Health Engineering Program, which also encompasses water resources, water pollution control, radiological health, industrial hygiene, and solid waste management.

The course of study leading to the degree of Master of Science is designed to provide engineers and scientists with necessary information required for positions of responsibility with Federal, State, and local air pollution control agencies, consulting engineers, and industry. The program leading to the Ph.D. degree is recommended for those individuals who plan to conduct basic research leading to solutions of some of the problems of air pollution identification and control. This program also prepares the individual for positions of responsibility with governmental agencies, consulting engineers, and industry as well as to teach college-level courses dealing with air pollution control.

The program of study at The University of Texas consists of formal courses, directed reading seminars, and a research project on which a thesis dealing with

(above left) University of Texas professor explains anemometer readout data.

(left) EHE students using gas analyzer to determine the composition of automobile exhaust.

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The University of Texas at Austin Austin, Texas

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The program of study at The University of Texas consists of formal courses, directed reading seminars, and a research project on which a thesis dealing with some aspect of air pollution control may be based. In addition to a thesis, the three basic core courses required of all M.S. students are:

Air Pollution Surveys and Analysis
Air Control Equipment Design
Unit Operations and Air Cleaning
(laboratory)

The remaining 15 hours required to complete the 30 hour curriculum are selected based on the needs, interests, and future goals of the student. The courses dealing directly with air pollution problems include:

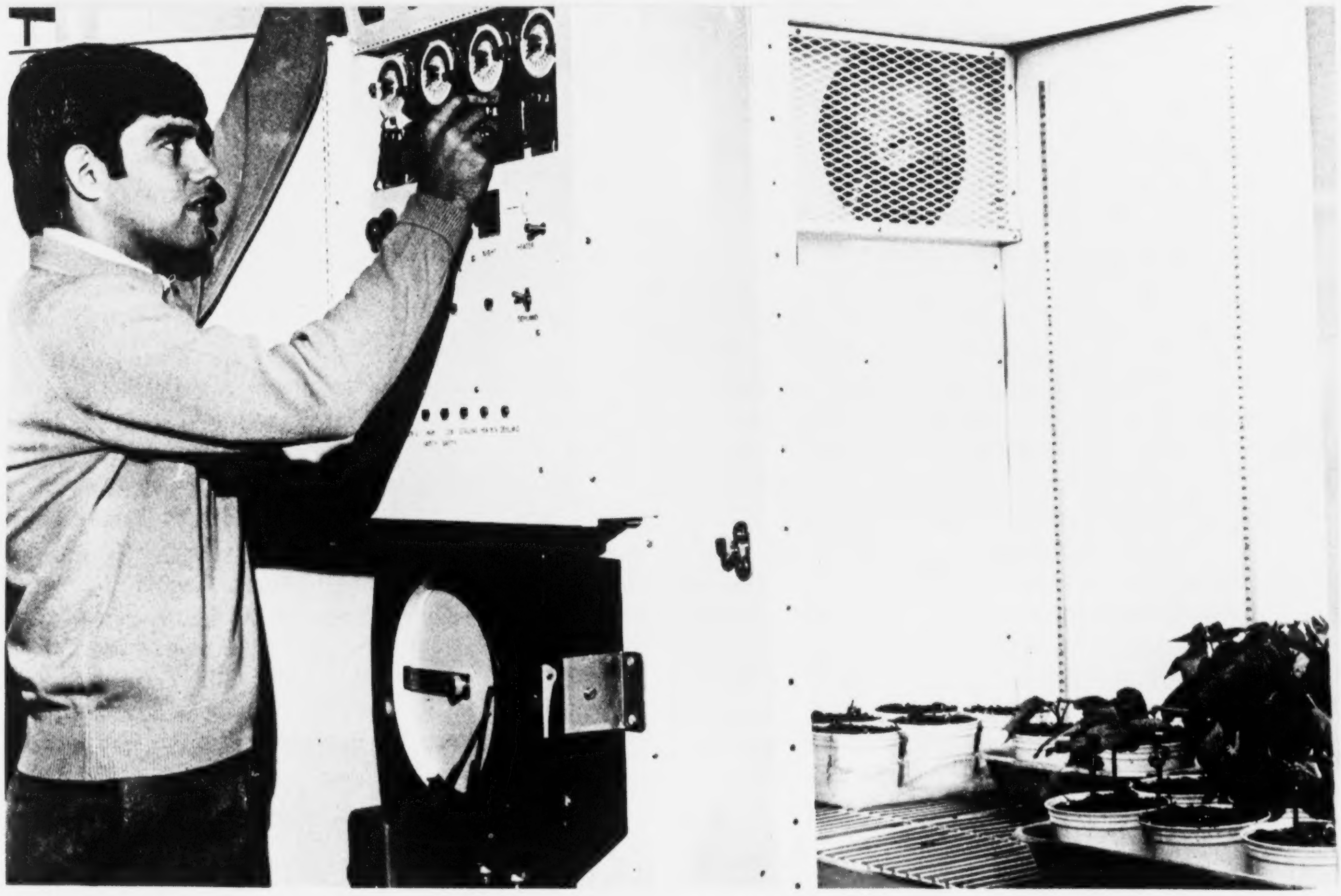
Air Pollution and Industrial Hygiene
Industrial Toxicology
Air and Water Analysis
Physics of the Atmosphere
Microclimatology

Special courses include:
Particle Technology
Photochemistry and Gas Kinetics
Theoretical Approaches to
Air Pollution Control

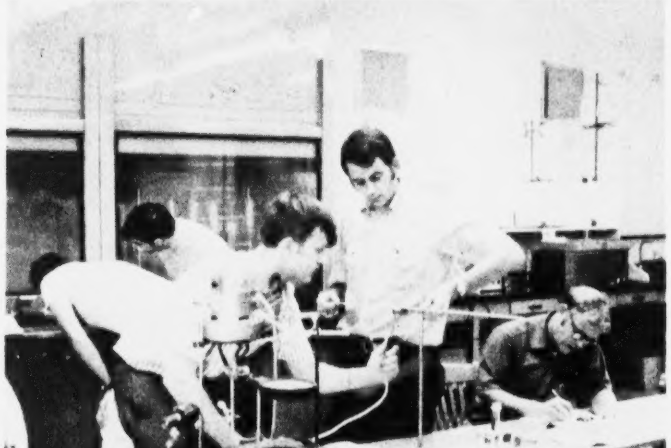
The Ph.D. program of work is flexible and is generally tailored to meet the needs, interests, and goals of the individual student. For additional information, write directly to: Dr. Patrick R. Atkins, ELB 307, The University of Texas at Austin, Austin, Texas 78712.

(above left) University of Texas professor explains anemometer readout data.

(left) EHE students using gas analyzer to determine the composition of automobile exhaust.



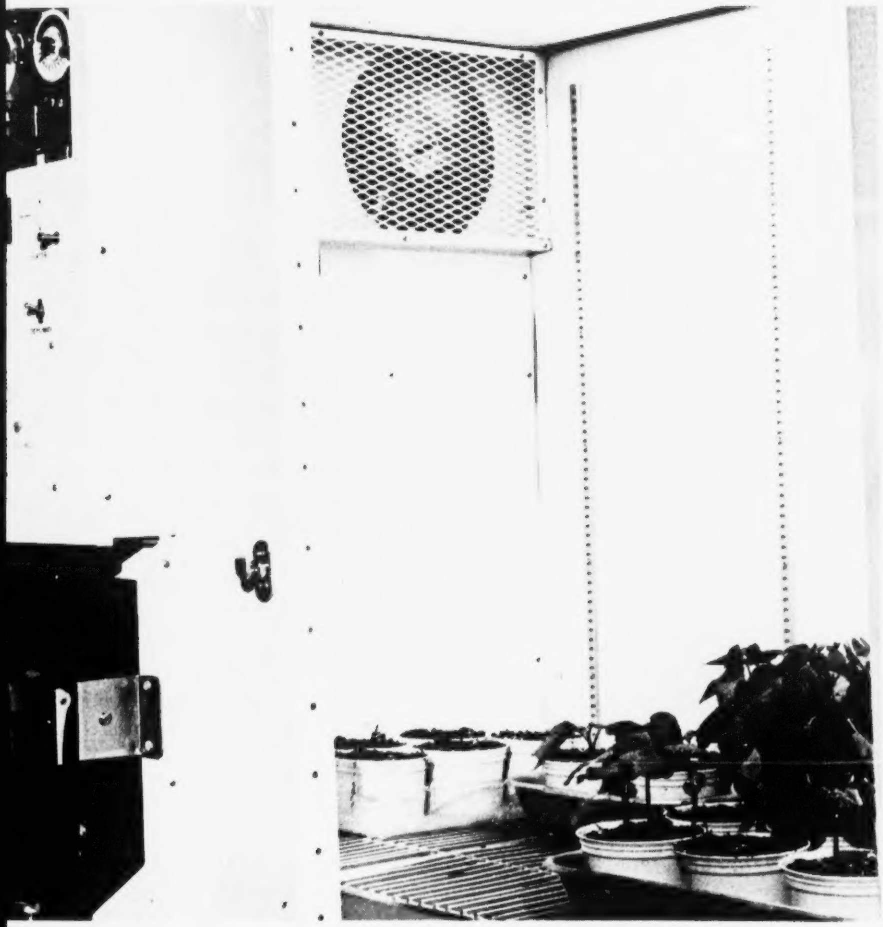
Field investigations are supplemented with laboratory research to evaluate economic loss from air pollution. A Penn State graduate trainee prepares an experiment at the Center for Air Environment Studies' Phytotoxicology Laboratories to determine recovery capabilities of plants following acute exposures to pollutants.



EHE students using hot-wire anemometers to measure air floats in exhaust heads and exhaust jets.

University of Texas professor instructs students in use of anemometer readouts to determine atmospheric turbulence parameters.

A project c



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measure air

University of Texas professor instructs students in use of anemometer readouts to determine atmospheric turbulence parameters.

A project demonstration at the University of Pittsburgh.

University of Pittsburgh

Pittsburgh, Pennsylvania

The three major purposes of the air pollution training program in the School of Public Health are (1) to develop practitioners in the field of air pollution control for positions in government and industry, (2) to develop high caliber researchers in aerosol physics, and (3) to make air pollution courses available to candidates in other programs.

In cooperation with the Graduate School of Engineering and the Division of Natural Sciences, an interdepartmental, interschool program has been developed for students working toward degrees in chemical engineering, civil engineering, or chemistry. In these programs, the student enrolls in air pollution courses in addition to the courses pertinent to his major field of study.

Requirements for the Master of Science degree are 36 to 38 credits. In addition to the air pollution courses listed below, degree programs include courses in biostatistics, epidemiology, physiology, and toxicology.

Air pollution related courses offered in this program include:

- Water and Air Chemistry
- Principles and Laboratory
- Air Pollution Principles
- Air Pollution Measurements
- Properties of Dusts, Smokes, and Mists
- Air Pollution Practice

For additional information write to the Program Director: Dr. Morton Corn, Professor of Industrial Health and Air Engineering, Graduate School of Public Health, University of Pittsburgh, 130 DeSoto Street, Pittsburgh, Pennsylvania 15213.

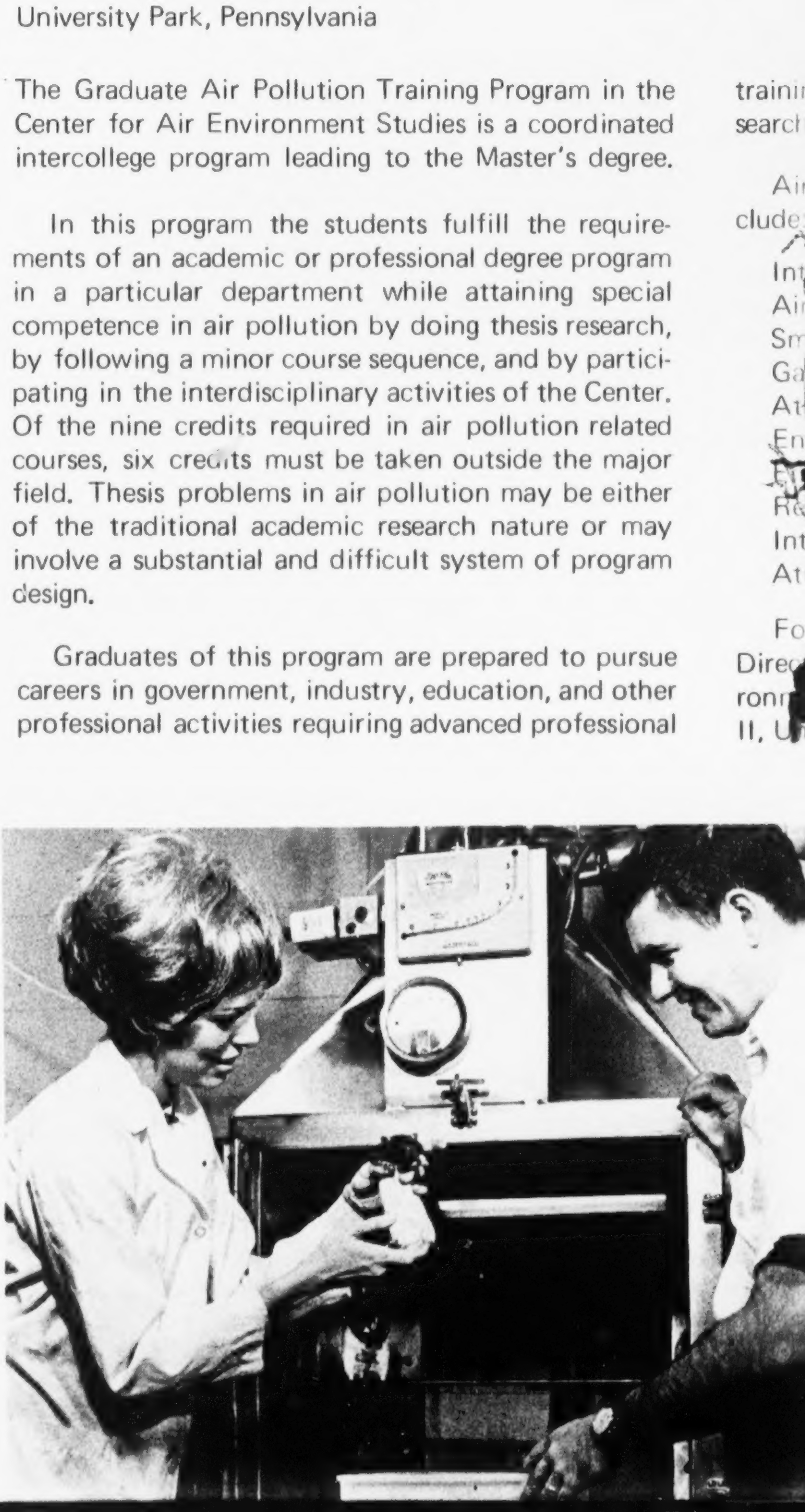
Pennsylvania State University

University Park, Pennsylvania

The Graduate Air Pollution Training Program in the Center for Air Environment Studies is a coordinated intercollege program leading to the Master's degree.

In this program the students fulfill the requirements of an academic or professional degree program in a particular department while attaining special competence in air pollution by doing thesis research, by following a minor course sequence, and by participating in the interdisciplinary activities of the Center. Of the nine credits required in air pollution related courses, six credits must be taken outside the major field. Thesis problems in air pollution may be either of the traditional academic research nature or may involve a substantial and difficult system of program design.

Graduates of this program are prepared to pursue careers in government, industry, education, and other professional activities requiring advanced professional



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Pennsylvania State University

University Park, Pennsylvania

The Graduate Air Pollution Training Program in the Center for Air Environment Studies is a coordinated intercollege program leading to the Master's degree.

In this program the students fulfill the requirements of an academic or professional degree program in a particular department while attaining special competence in air pollution by doing thesis research, by following a minor course sequence, and by participating in the interdisciplinary activities of the Center. Of the nine credits required in air pollution related courses, six credits must be taken outside the major field. Thesis problems in air pollution may be either of the traditional academic research nature or may involve a substantial and difficult system of program design.

Graduates of this program are prepared to pursue careers in government, industry, education, and other professional activities requiring advanced professional training in a discipline coupled with training and research of the air pollution problem.

Air pollution related courses in this program include:

- Introduction to Air Pollution Control
- Air Pollution Seminar
- Small Particle Technology
- Gas Phase Reactions
- Atmosphere Chemistry
- Environmental Health
- Environmental Pathology
- Respiratory Physiology
- Introduction to Micrometeorology
- Atmospheric Diffusion

For additional information, write to the Program Director: Dr. William J. Moroz, Center for Air Environment Studies, 226 Chemical Engineering Building II, University Park, Pennsylvania 16802.

Penn State graduate trainees, at the Center for Air Environment Studies' Physiology Laboratories, prepare animals for a long term exposure to pollutants commonly found in urban air.

University of Utah Salt Lake City, Utah

The interdepartmental air pollution training program provides a broad training in the sources, control, distribution, measurement, fate, and economic effects of air pollutants. Biological effects from the molecular to population levels are stressed. The integrated air pollution research program, and field trips, provide students with practical experience in air pollution problems. An academic background in air pollution science is provided by a group of core and related elective courses offered by participating Departments of Engineering, Meteorology, Biological Sciences, Economics, Geography, and Sociology.

Student selection is based on a sound background in their field, high academic record, and an interest in air pollution. The major discipline is optional, but the thesis research problem must be directly related to air pollution. Upon completion of the program, students receive their M.S. or Ph.D. degree in their major department with a minor in air pollution science. The degree requirements for the M.S. are 33 hours in the major subject and 12 hours in the minor, and for the Ph.D., 60 hours in the major and 30 hours in the minor. Trainees develop a broad understanding and technical skill in the overall field of air pollution enabling them to evaluate and interpret an air pollution situation and to recommend, initiate, or conduct the proper course of action.

Air pollution related courses offered in this program include:

Air Pollution Ecology
Environmental Toxicology
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Rutgers University New Brunswick, New Jersey

The Department of Environmental Sciences offers an interdisciplinary and interdepartmental graduate program in Air Resources Management to qualified scientists and engineers. Programs leading to a M.S. and Ph.D. are available.

The course of study for each student is designed according to his background, needs, and professional objectives. Students so trained are well qualified for positions in State and Federal agencies, in research institutions, in industry, and in teaching.

Air Pollution related courses offered in the program include:

Principles of Air Pollution Control
Air Sampling and Analysis
Source Control of Atmospheric Pollutants
Microclimatology
Synoptic Meteorology
Atmospheric Physics
Tropospheric Chemistry
Effects of Air Pollutants on Vegetation
Air Pollution Seminar
Occupational Health and Industrial Hygiene
Principles of Environmental Sciences

Numerous other departmental offerings in water pollution, solid waste management, environmental biology, environmental chemistry, and environmental radioactivity are available to the student as well as courses from other departments of the University. The courses taken from other departments are usually chemica
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Air pollution related courses offered in this program include:

Air Pollution Ecology
Environmental Toxicology
Air Pollution Seminar
Air Pollution Meteorology
Microclimatology
Atmospheric Diffusion
Atmospheric Turbulence
Air Pollution Control Methods
Radiological Health
Ecological Physiology
Environmental Sanitation
Sanitation Biology
Community Systems

For additional information write to the Program Director: Dr. Michael Treshow, Associate Professor, Biological Sciences, Center for Environmental Biology, University of Utah, Salt Lake City, Utah 84112.

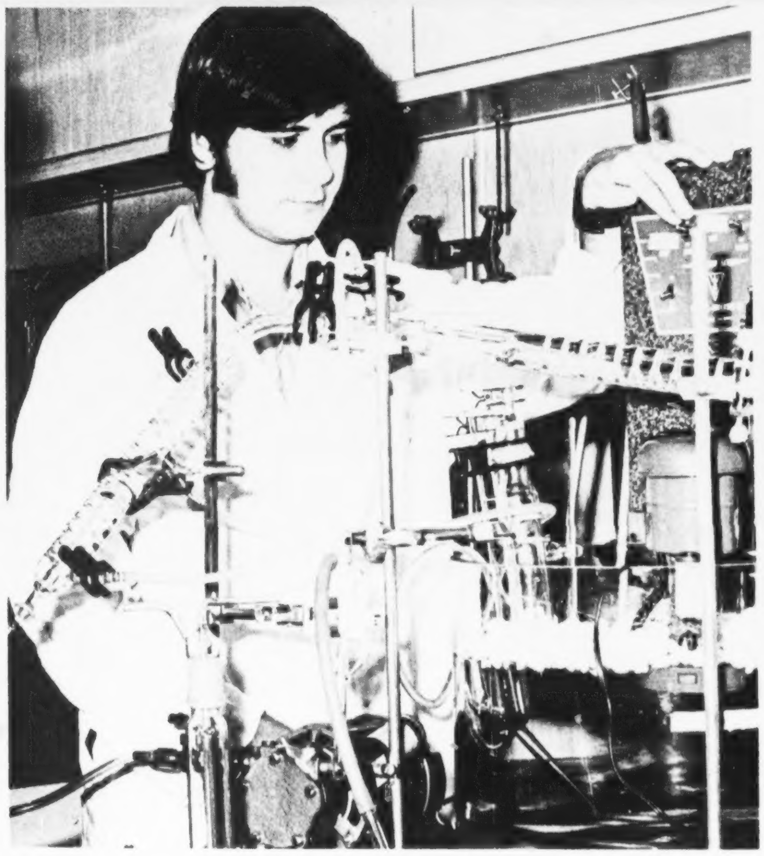
Source Control of Atmospheric Pollutants
Microclimatology
Synoptic Meteorology
Atmospheric Physics
Tropospheric Chemistry
Effects of Air Pollutants on Vegetation
Air Pollution Seminar
Occupational Health and Industrial Hygiene
Principles of Environmental Sciences

Numerous other departmental offerings in water pollution, solid waste management, environmental biology, environmental chemistry, and environmental radioactivity are available to the student as well as courses from other departments of the University. The courses taken from other departments are usually chemical engineering, chemistry, physics, biology, meteorology, programming, physiology, and plant biology.

The departmental facilities include three laboratories equipped with exposure chambers, reactors, and monitoring equipment for conducting research in photochemical air pollution, aerosol mechanics, and surface interactions. Other areas of research include: control technology, analytical methodology, source-sink studies.

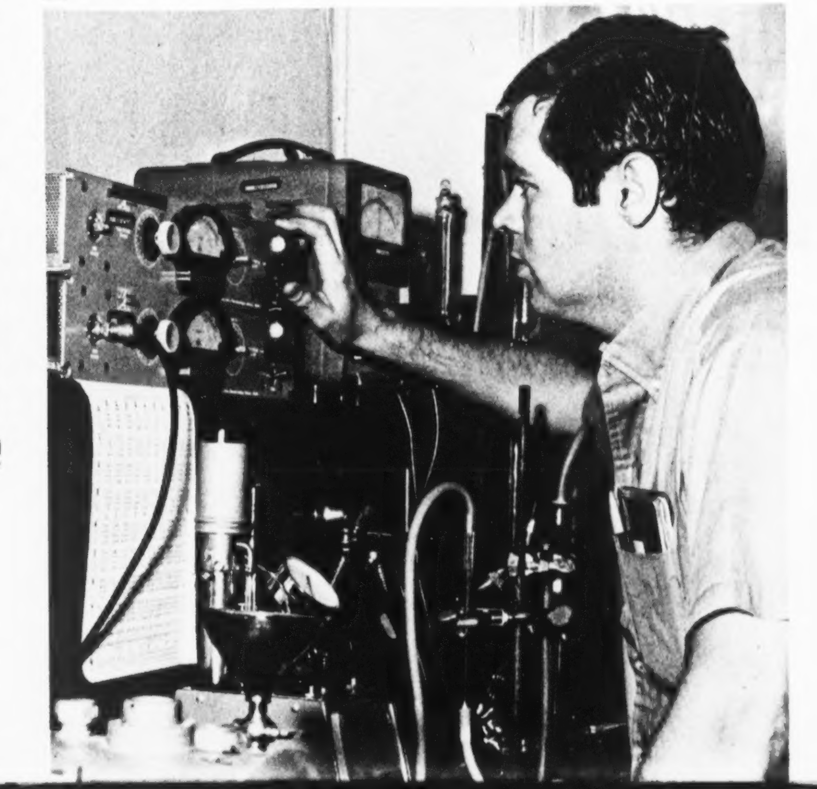
For additional information, write to the Program Director: Dr. A. J. Kaplovsky, Chairman, Department of Environmental Sciences, Rutgers University, New Brunswick, New Jersey 08903.

Sampling the stack — up on the roof of the Georges Road laboratories, graduate class in "Air Sampling and Analysis" proceeds to put their winter's worth of learning to work.



Graduate students preparing synthetic atmospheres for two courses: Effects of Pollutants on Materials and Fates of Pollutants.

(below) A Rutgers Ph.D. student studies the behavior of submicron particles.



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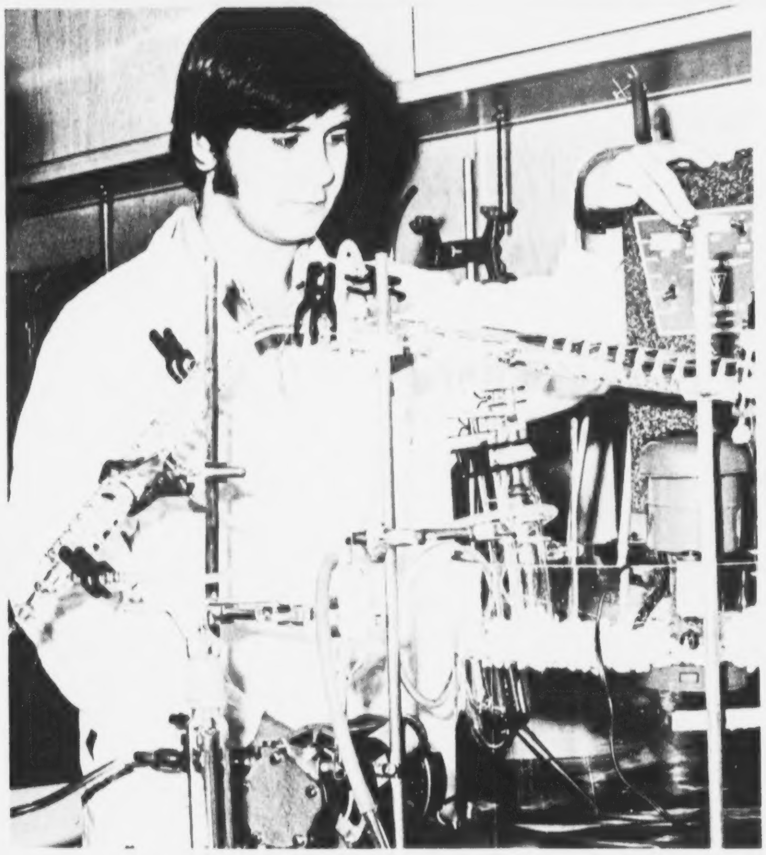

Graduate students preparing synthetic atmospheres for two courses: Effects of Pollutants on Materials and Fates of Pollutants.

Rutgers scientist studying the effects of air pollutants on plants in a dynamic exposure chamber.

(below) A Rutgers Ph.D. student studies the behavior of submicron particles.

(below) Graduate students analyzing air samples for metals using atomic absorption spectrophotometry.

West Virginia University Morganton, West Virginia

The purpose of this program, centered in the Department of Civil Engineering, is to give students a technical background in air pollution and its control. It is to be used as a foundation for obtaining concerted action directed at preventive protection and qualitative improvement of the environment. Methods stressed include the prevention of air pollution, development of better public health practices, community planning, conservation of natural resources, and comprehensive planned industrial development.

The Master of Science degree programs may be completed in three ways: 24 hours minimum course work and a research thesis, 30 hours minimum course work and a project or problem report, 36 hours minimum course work.

Chemical, civil, electrical, industrial, and mechanical engineering graduates may emphasize air pollution control for a Master of Science degree in their field, or a Master of Science in Engineering, undesignated. A limited number of graduates from other fields are also able to take strong minors in air pollution control with stipend support. To date, these have included political science and economics majors. Several chemists and physicists with degrees have shifted to engineering, with added course work to make up deficiencies.

Ph.D. programs are available within the College of Engineering in which air pollution control is the major emphasis. Air pollution related courses include:

Properties of Air Pollutants
Air Pollution Control Engineering
Air Pollution Control Standards
Air Pollution Control Programs
Complex Organizations
Waste Water Treatment
Urban Planning
Public Administration
Meteorological Dispersion and Diffusion

Key courses are taught by faculty who have had

University of Washington Seattle, Washington

The air resources program is designed to provide specialized training in air resources engineering for engineering candidates, seeking the M.S. degree, who expect to join air pollution control programs in Federal, state or local governments, private industry, or consulting firms. It is also designed for study and research leading to the Ph.D. degree.

The program is sponsored by the Department of Civil Engineering with the cooperation of the Department of Atmospheric Sciences. Supplemental courses are available from other engineering disciplines, health sciences, social and political sciences, and public administration.

The M.S. degree program (one year) requires a thesis. Requirements for the Doctorate include a program of study and research acceptable to the candidate's advisor and a supervisory committee. A dissertation that is a significant contribution to air pollution knowledge and a general examination in air resources in a minor supporting field are also required.

Air pollution related courses offered in this program include:

Air Resources Engineering I, II
Air Resources Management

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Ph.D. programs are available within the College of Engineering in which air pollution control is the major emphasis. Air pollution related courses include:

- Properties of Air Pollutants
- Air Pollution Control Engineering
- Air Pollution Control Standards
- Air Pollution Control Programs
- Complex Organizations
- Waste Water Treatment
- Urban Planning
- Public Administration
- Meteorological Dispersion and Diffusion

Key courses are taught by faculty who have had extensive experience with industries and in governmental air pollution control agencies. Graduates will be accepted from civil, chemical, electrical, industrial and mechanical engineering, chemistry, physics, and other sciences. A limited number of graduates with degrees in other fields are accepted into the program with full financial support.

The complex terrain of the lovely West Virginia hills features the chemical process industries, metallurgical industries, extractive minerals mining, and fossil fuel electricity generating plants. These, together with small and medium-sized cities and other industries, make West Virginia University an excellent place for air pollution contrology, controllation, and related studies.

For additional information, write to the Program Director: Professor Benjamin Linsky, P.E., Department of Civil Engineering, College of Engineering, West Virginia University, Morgantown, West Virginia 26506.

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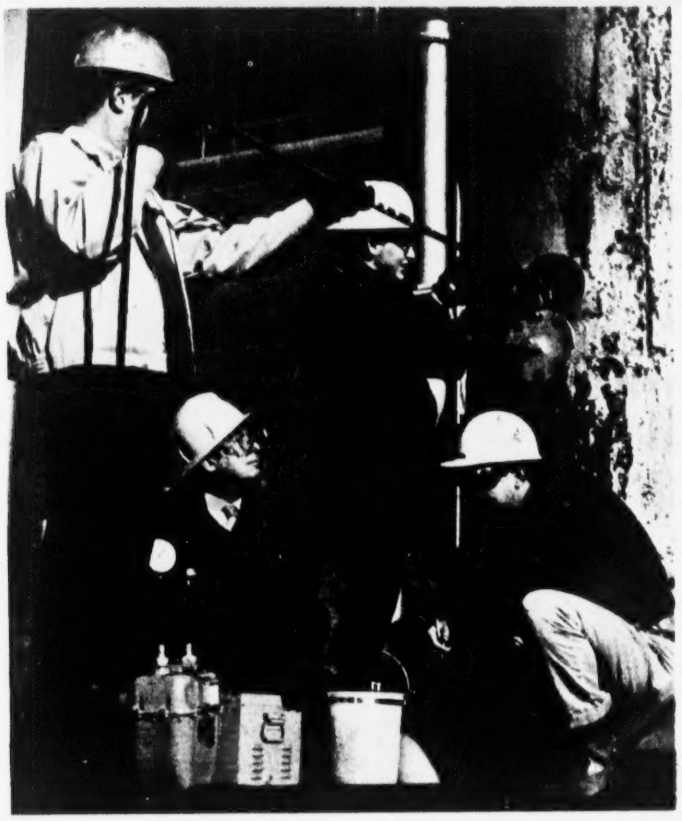
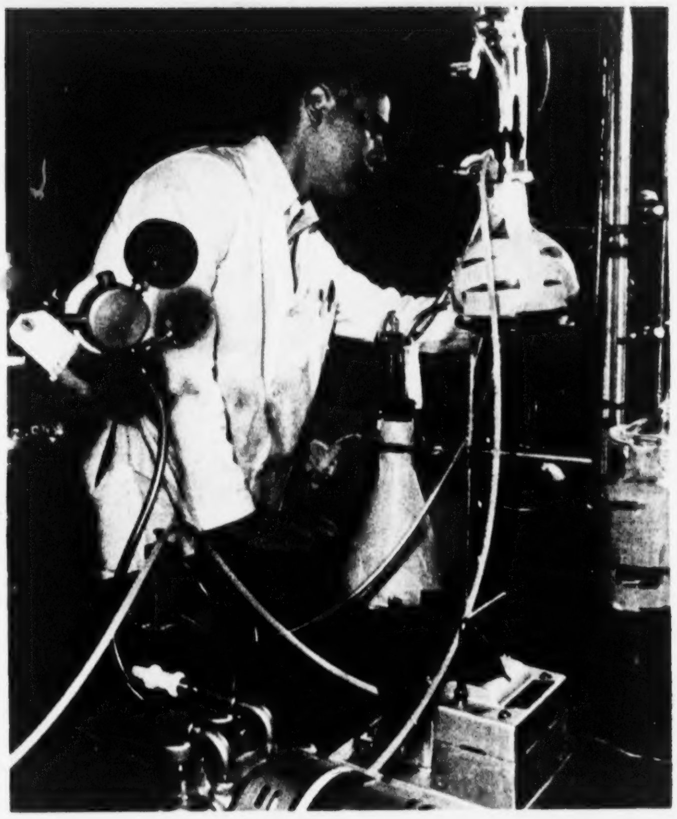
Air pollution related courses offered in this program include:

- Air Resources Engineering I, II
- Air Resources Management
- Topics in Environmental Health Engineering
- Air Conditioning (Industrial Ventilation and Gas Cleaning)
- Chemistry of Air Pollution
- Aerosol Science and Technology I, II

For additional information write to the Program Director: Dr. August T. Rossano, Jr., Research Professor, Department of Civil Engineering, College of Engineering, University of Washington, Seattle, Washington 98105.



Graduate students take air pollution samples, from a coal-fired heating plant at West Virginia University, under normal test conditions. Another part of this class assignment was to measure the undesirable effects on a nearby building site.



Graduate students in air pollution control at West Virginia University's College of Engineering have to master many trades. In this experiment the student is producing a special mixture of air pollutants to which various manufactured articles will be exposed. The results will be used in the development of standards of acceptability for soiled surfaces. The bottles are taped as a safety measure.

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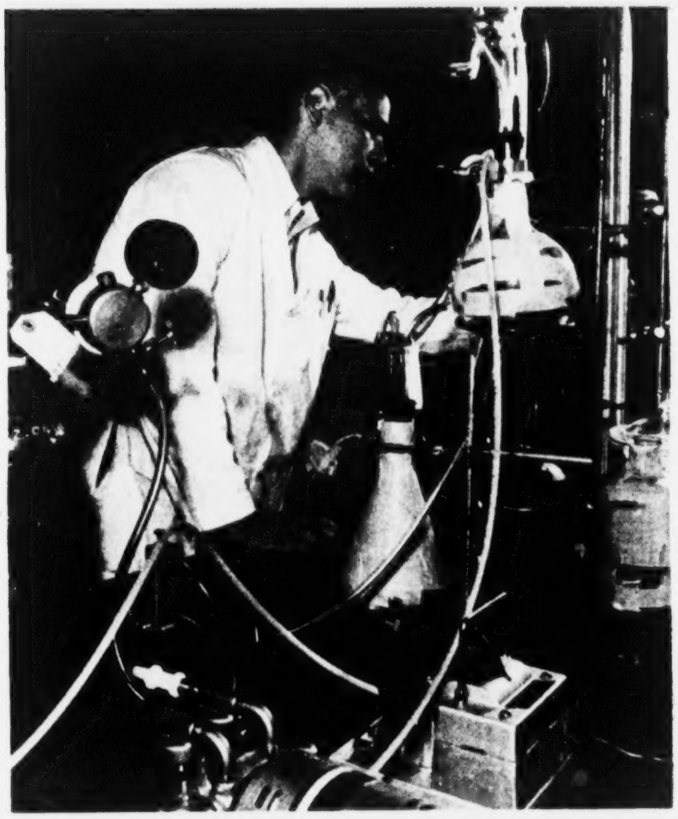

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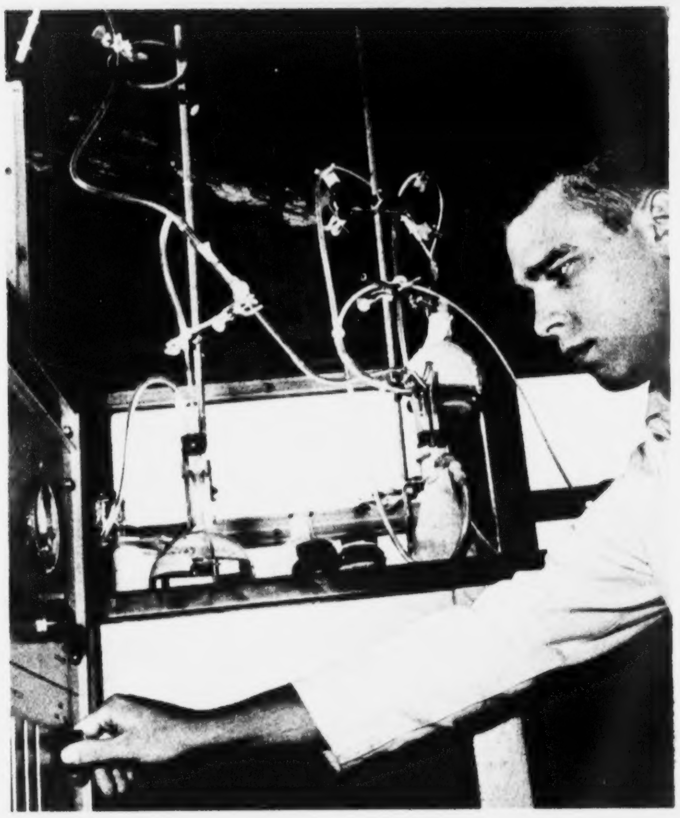
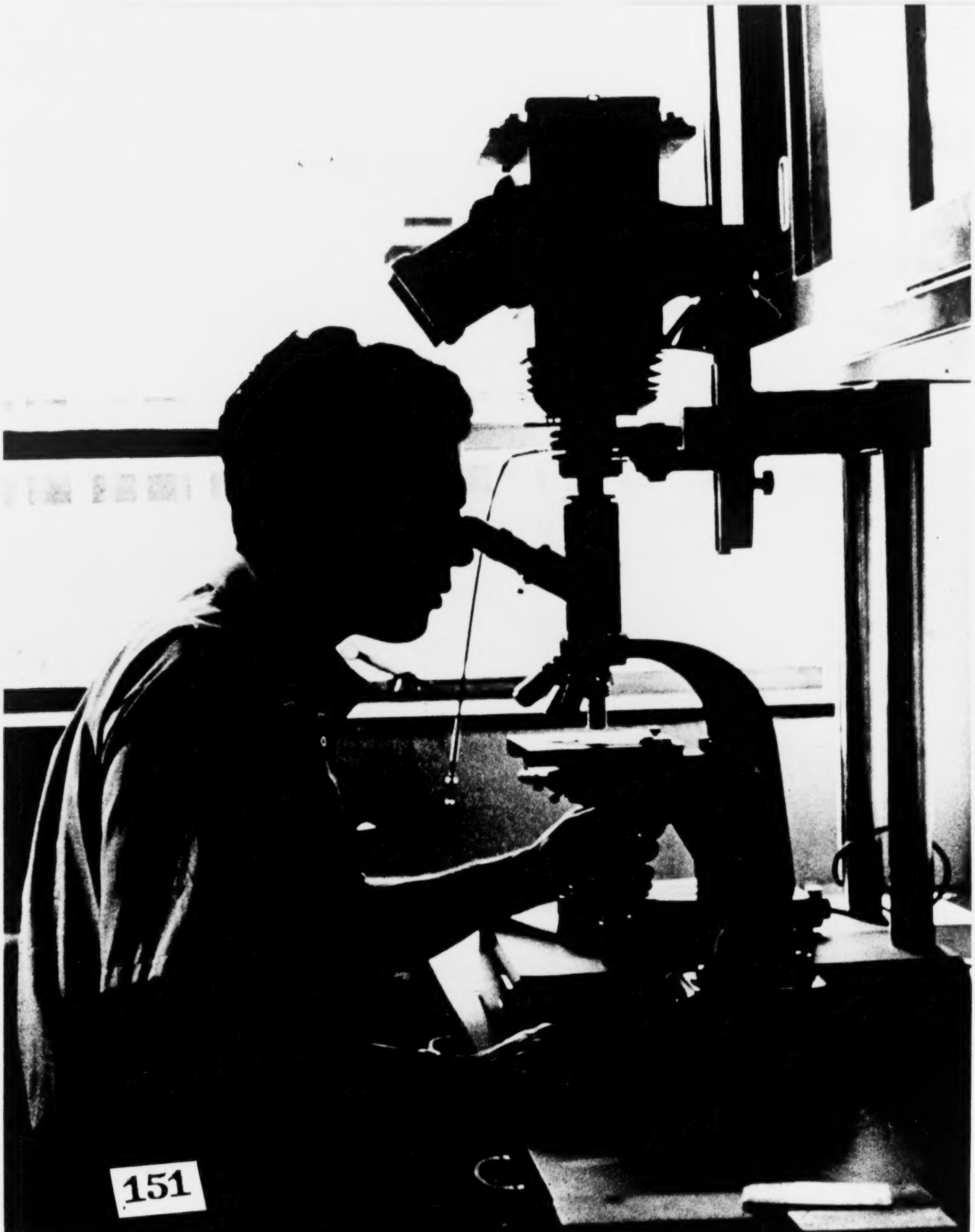


Special equipment had to be developed to count and determine the sizes of small droplets and bits of dust. This instrument is being used at West Virginia University's College of Engineering both in research and in training air pollution control engineering specialists. The bottles are taped as a safety measure.

Sucking out a match (left picture) isn't the same thing as blowing out one. This fundamental principle of the flow of air is explained at West Virginia University's College of Engineering to a graduate student, as he does his best to suck out the flame. Although the air velocities generated at your lips by sucking and blowing are about the same, the results are vastly different a few inches away. An understanding of this principle is essential for designing dust and gas traps to prevent air pollution. (right picture) Demonstrates the same principle with an air velocity meter and a high-volume air sampler.



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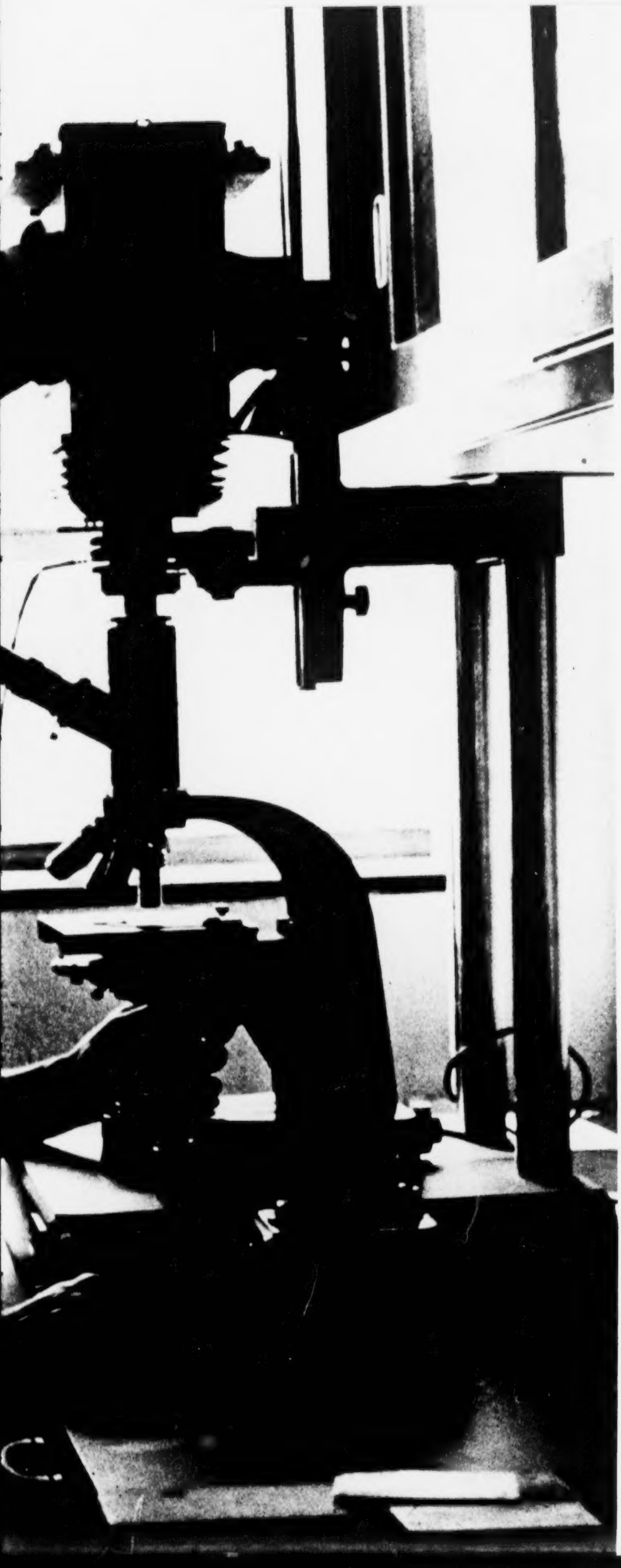
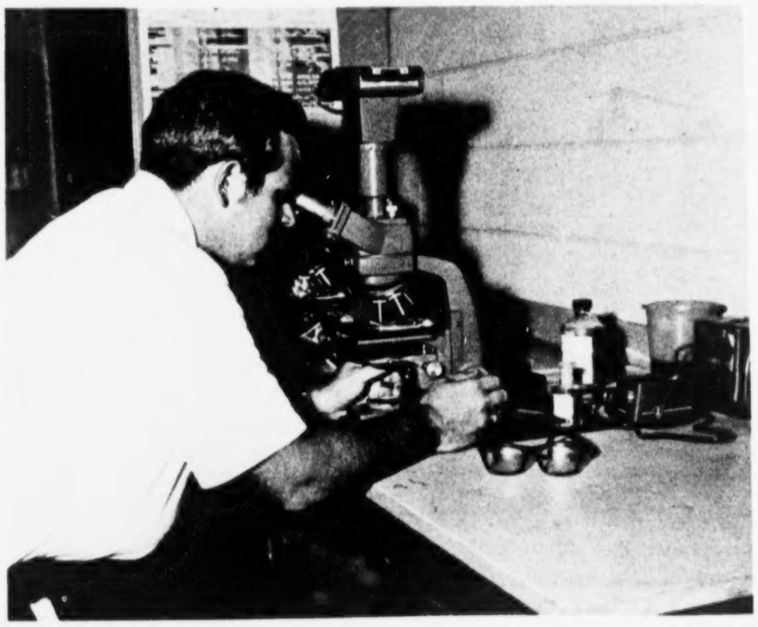
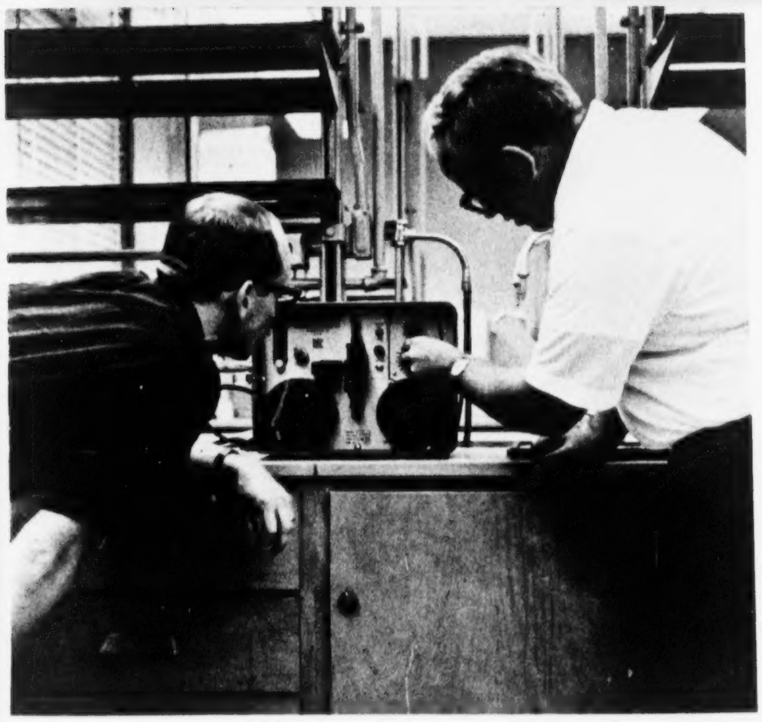


Faculty member explains the operating principles of an electrostatic precipitator sampler to Purdue University students.



Purdue University student uses microscope to examine particulate matter collected by "Rota-Rod" sampler.

(left) Microscopic study, as an aid in air pollution abatement, of the structure of a particle reveals their possible origin.



Students at Purdue University check-out tape sampler before putting it into operation at the environmental monitoring station on campus.

Purdue University Lafayette, Indiana

The interdisciplinary graduate program at Purdue University provides specialists training to students pursuing careers in air pollution control. Supplemental training is offered to trainees in allied fields who will impinge on the overall environmental problems of man. The integrated training and fundamental research activities provide opportunities to participate in many areas of air pollution control. In all cases, the specific plan of study is tailored to the student's needs and desires. Master of science and doctor of philosophy degrees are offered.

Air pollution related courses offered in this program include:

Air Pollution and Its Effects

Drexel University Philadelphia, Pennsylvania

The Air Resources Curriculum is a graduate program in Environmental Engineering and Science, and is one phase of "The Center for the Study of the Environment," which provides a broad base of training in physical and social environmental sciences, applicable to all areas of concern. The multidisciplinary program offers intensive specialized training in several specific areas: air resources, water resources, radiological health, occupational health, solid waste, food technology, and the socioeconomic effects of the environment. Air Resources was the first specialty course offered when the program was initiated in 1963, and the other courses have been added since.

The present Air Resources Curriculum (48 credits) leads to an M.S. degree in one year (four quarters); the fourth quarter is devoted to completion of a special project relating course work completed to real time exposure with air pollution problems of concern to local or state agencies and industries. A doctoral degree may also be obtained.

Air pollution related courses offered in this program include:

Air Pollution Control Processes
Air Pollution Distribution and Effect
Air Pollution Sources
Air Resources Management
Air Sampling and Analysis
Biostatistics
Combustion Theory
Environmental Chemistry
Environmental Health
Environmental Instrumentation
Environmental Physiology
Environmental Systems Analysis
Epidemiology
Fate of Pollutants
Human Factors Engineering
Incinerator Design
Industrial Location and Regional Development
Industrial Ventilation

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Purdue University Lafayette, Indiana

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Air pollution related courses offered in this program include:

Air Pollution and Its Effects
Air Sampling, Analysis, and Instrumentation
Air Pollution Technology and Control Theory
Chemical Kinetics of Pollutants
Theoretical and Applied Meteorology
Microclimatology
Biometeorology
Chemical Analyses in Environmental Engineering
Systems Design and Application to
Natural Resources
Environmental Toxicology

For additional information write to the program coordinator: Dr. David L. Brenchley, School of Civil Engineering, Purdue University, Lafayette, Indiana 47907

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Biostatistics
Combustion Theory
Environmental Chemistry
Environmental Health
Environmental Instrumentation
Environmental Physiology
Environmental Systems Analysis
Epidemiology
Fate of Pollutants
Human Factors Engineering
Incinerator Design
Industrial Location and Regional Development
Industrial Ventilation
Odor and Taste
Meteorology
Meteorology of Air Pollution
Particle Dynamics
Public Health Administration
Radiobiology
Radiological Health
Solid Waste Systems
Stack Sampling Methods
Toxicology
Transport Processes
Urban Sociology
Water Resources Management
Operations Research

For additional information write to the Program Director: Dr. Henry C. Wohlers, Professor Environmental Science, Environmental Engineering and Sequence, Drexel University. 32nd and Chestnut Streets, Philadelphia, Pennsylvania 19104.

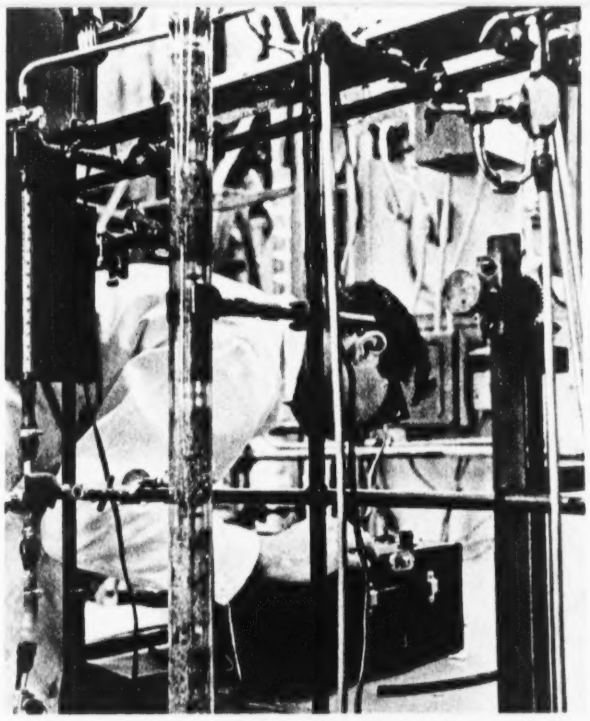
Cooper Union
New York City, New York

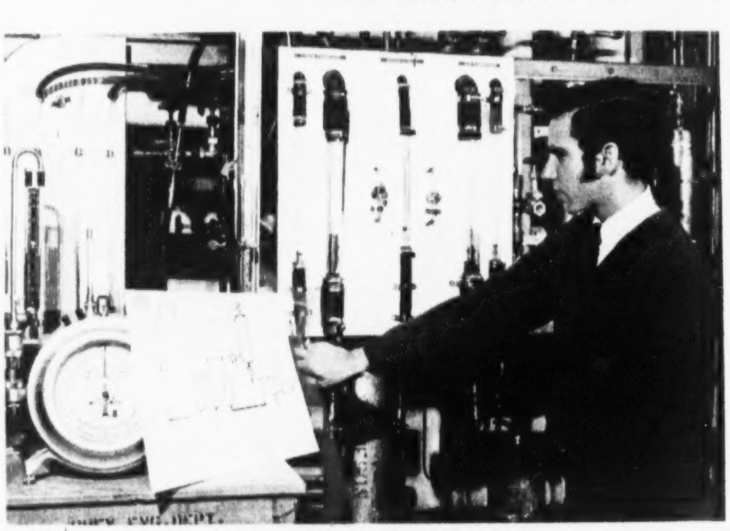
The program at Cooper Union offers students in civil, mechanical, chemical and electrical engineering an M.S. degree. This M.S. study plans to produce professional engineers well versed in thermodynamics, mass transfer, and the fundamental properties and behavior of dilute particle-gas systems. The major emphasis is placed on the technical fundamentals with secondary emphasis on general air pollution control. This knowledge enables the student to develop exploratory designs for the control of atmospheric contaminants at their source.

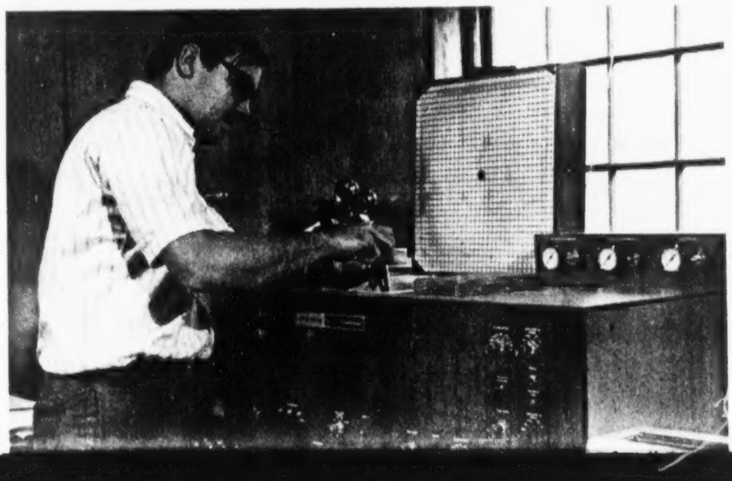
Air pollution related courses offered in this program include:

Air Pollution Control Systems I and II
Aspects of Air Pollution I and II
Graduate Humanities Seminar
Numerical Analysis
Material Science
Thermodynamic Behavior
Transport Phenomena

Six elective credits may be taken in engineering design from specialized courses in chemical, civil, mechanical or electrical engineering. Thesis work is oriented to exploratory design in air pollution control. For additional information, write to the Program Director: Dr. John L. Bove, Prof. of Chemistry, Cooper Union, 51 Astor Place, New York, New York 10003.


Laboratory study at Cooper Union.


Laboratory study at the University of Massachusetts of SO_2 removal by water scrubbing uses an unusual packing device.



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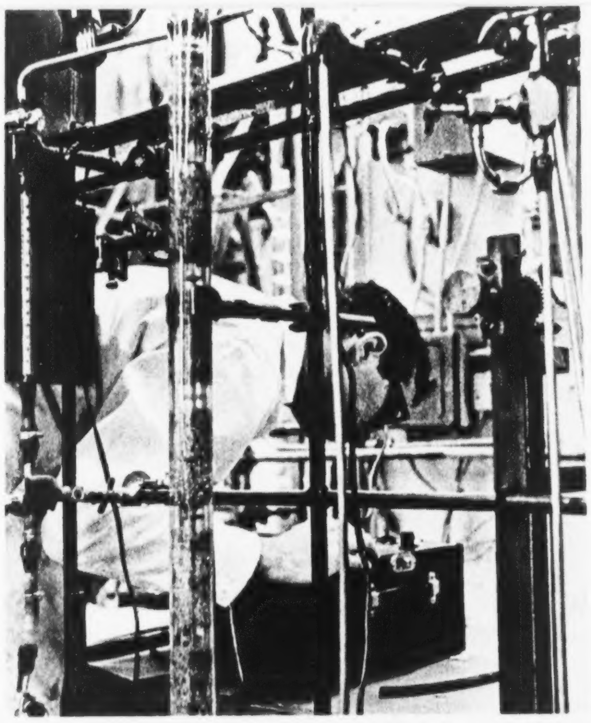
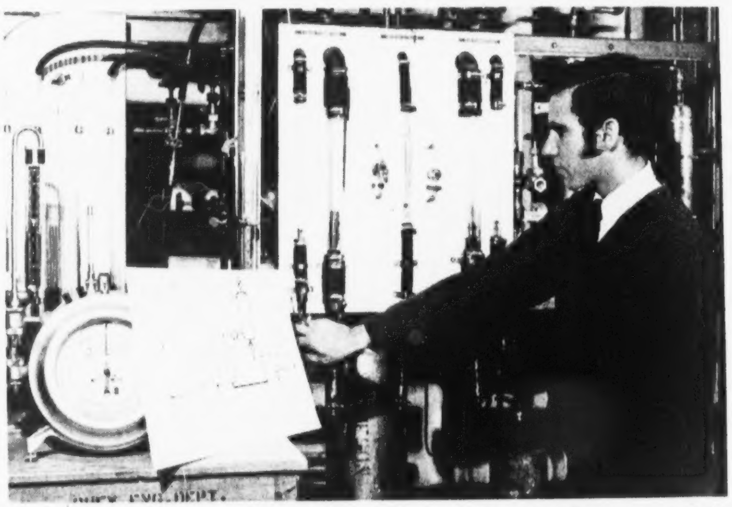


Laboratory study at Cooper Union.



Laboratory study at the University of Massachusetts of SO_2 removal by water scrubbing uses an unusual packing device.

(left) University of Massachusetts graduate student using a chromatograph to analyze air samples.

University of Massachusetts

Amherst, Massachusetts

The University of Massachusetts offers an interdepartmental program leading to a Master's degree in chemical engineering, environmental engineering within the division of civil engineering, or public health. Air pollution training is offered within the framework of the professional objectives of each department. One calendar year Master of Science programs are offered by the Departments of Chemical and Civil engineering, (approximately 32 credits); a 2-year program (approximately 39 credits) is offered by the School of Public Health. Core courses for all program participants are:

Air Pollution Control Processing
Micrometeorology
Air Sampling and Air Analyses
Introduction to Air Pollution
Air Pollution Seminar

The Department of Environmental Sciences offers a course in biological effects of air pollution and provides research opportunities in air pollution studies.

The balance of credits required for the Master's degree may be obtained from supporting departmental courses, by thesis, and/or by completion of special problem assignments.

For additional information, write to Program Directors: Dr. T. H. Feng, (Civil Engineering), Dr. D. D. Adrian (Civil Engineering), or Dr. H. A. Peters (Public Health, University of Massachusetts, Amherst, Massachusetts 01002.

University of Maryland, College Park, Maryland

The College of Engineering at the University of Maryland offers an interdisciplinary graduate study program in air pollution control leading to the degrees of Master of Science and Doctor of Philosophy.

Air quality conservation embraces so many disciplines and specializations that in-depth knowledge in all the areas of concern is difficult to obtain. This knowledge is essential, however, to those engineers, chemists, public health officials, and other specialists who are now being called upon to restore and conserve air quality. This program is directed to those who aspire to such responsibilities and places emphasis upon the engineering aspects of air resource management.

Qualified college graduates from all areas of engineering and science may enroll and work toward a degree in air pollution control through one of the three participating areas — chemical engineering, civil engineering, or meteorology. Core courses are:

Air Pollution
Air Sampling and Analysis
Seminar in Atmospheric Pollution
Meteorology of Air Pollution
Control of Air Pollution Sources
Air Pollution Biology

Other courses may be selected from the University curriculum to provide background and specialization of particular value to trainees seeking careers in air pollution control.

For additional information, write to the Program Director: Dr. Gerhard Israel, Assistant Professor in Meteorology and Civil Engineering, Department of Civil Engineering, University of Maryland, College Park, Maryland 20742.

The Johns Hopkins University, Baltimore, Maryland

The Johns Hopkins University offers a Master's program in air pollution control and a doctoral study program of the atmospheric environment. The programs are cooperative efforts of the departments of geography and environmental engineering and chemistry at the Homewood campus, and the department of environmental health and environmental medicine at the School of Hygiene and Public Health.

The one-year Master's program provides additional education for bachelors of the physical, biological, and engineering sciences who wish to apply their knowledge and capabilities to the challenging field of air pollution control. Students enroll for courses in statistics and in epidemiology, in addition to the following:

Air Pollution Control and Strategy
Air Pollution Control and Evaluation Laboratory
Biological and Physiological Effects of Air Pollution
Atmospheric Dispersion and Diffusion
Air Science and Management Seminar

Students may also select optional courses given by the chemistry, meteorology, and environmental medi-

The University of Maryland conducts short courses in visible emissions evaluation to train smoke observers for plume evaluation and law enforcement, since the State of Maryland limits visible emissions from sources of air pollutants.

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Air Pollution Control and Strategy
Air Pollution Control and Evaluation Laboratory
Biological and Physiological Effects of Air Pollution
Atmospheric Dispersion and Diffusion
Air Science and Management Seminar

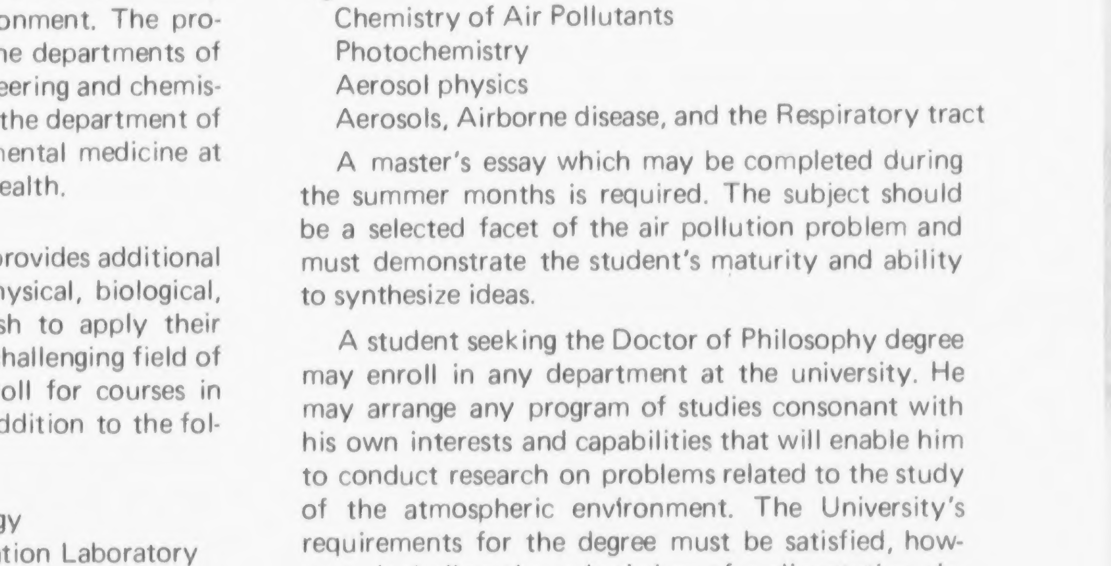
Students may also select optional courses given by the chemistry, meteorology, and environmental medicine departments, and these additional program offerings:

Chemistry of Air Pollutants
Photochemistry
Aerosol physics
Aerosols, Airborne disease, and the Respiratory tract

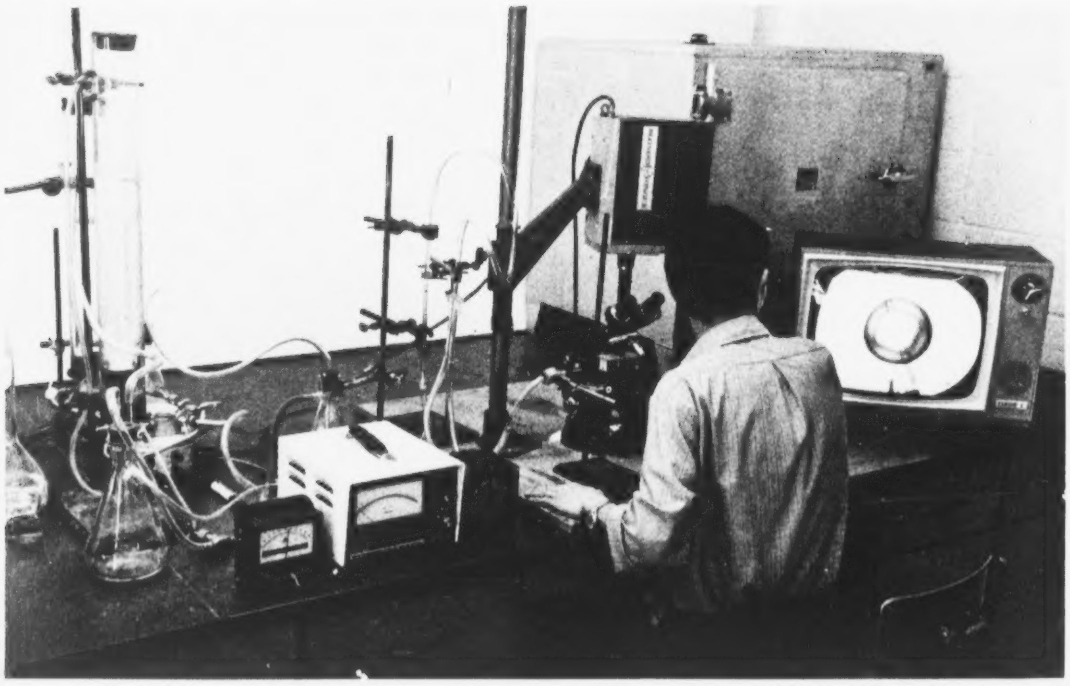
A master's essay which may be completed during the summer months is required. The subject should be a selected facet of the air pollution problem and must demonstrate the student's maturity and ability to synthesize ideas.

A student seeking the Doctor of Philosophy degree may enroll in any department at the university. He may arrange any program of studies consonant with his own interests and capabilities that will enable him to conduct research on problems related to the study of the atmospheric environment. The University's requirements for the degree must be satisfied, however, including the submission of a dissertation describing an original research contribution.

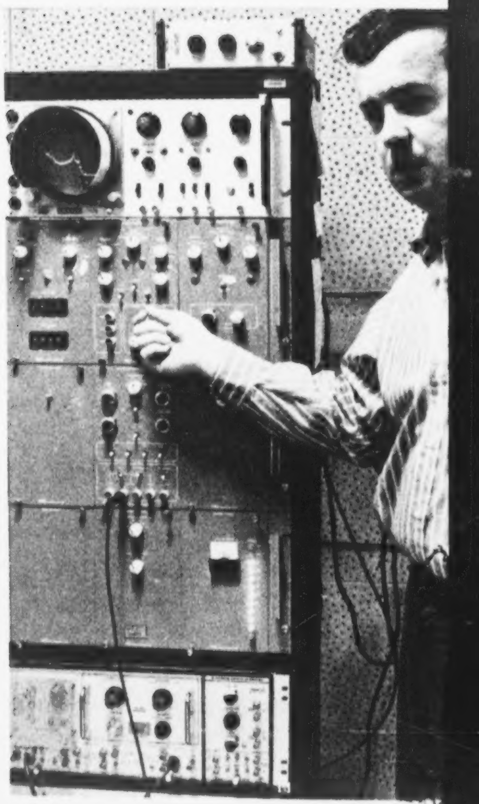
For additional information, write to the Program Director: Dr. Jerome Gavis, Department of Geography and Environmental Engineering, The Johns Hopkins University, Baltimore, Maryland 21218.



The University of Maryland conducts short courses in visible emissions evaluation to train smoke observers for plume evaluation and law enforcement, since the State of Maryland limits visible emissions from sources of air pollutants.



Dynamics of water vapor condensation about a crystal suspended on a filament is observed with the aid of microscopic magnification and closed-circuit television. The study seeks to establish the influence of pollution on natural atmospheric processes.



Neutron activation analysis being appli termine the presence and concentratio sub-microgram region of about 24 elemen

Georgia Institute of Technology Atlanta, Georgia

The Georgia Tech Graduate Air Quality Control Training Program is designed to prepare engineers and scientists for entry into the environmental control field. An interdisciplinary curriculum is offered to supplement graduate degree requirements in the established branches of engineering and science. Four general areas of instruction and research are stressed. These are:

- Emission control for industrial and power-generating processes
- Microanalysis and sampling of contaminants
- Atmospheric reactions, diffusion, and dispersion of pollutants
- Effects of pollutants on humans, animals, and plants

Requirements for the Master of Science degree are 33 credits plus thesis research in problems related to air pollution.

Air quality related courses offered in the program are:

- Aerosol Technology
- Industrial Emission Control
- Atmospheric Reactions
- Fine Particle Technology
- Analysis of Atmospheric Contaminants
- Air Pollution Biology
- Air Pollution Measurements and Control
- Engineering Aspects of Environmental Health
- Power Plant Engineering
- Combustion and Flames

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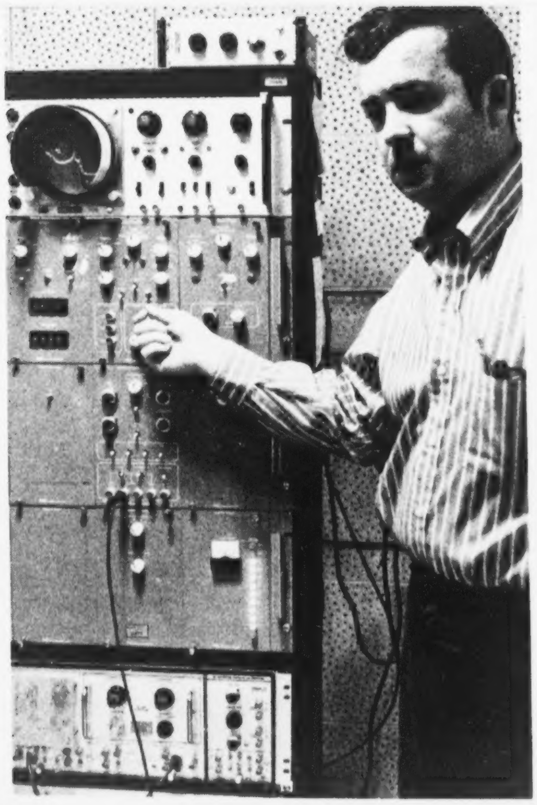
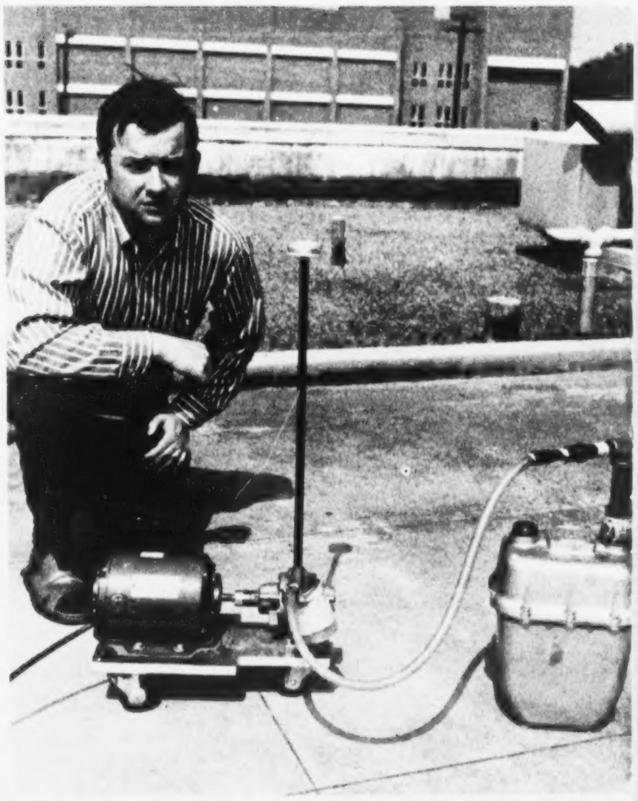


Neutron activation analysis being applied to determine the presence and concentration in the sub-microgram region of about 24 elements.



Particulate matter from a sample of 20 to 50 m^3 of air is being collected on a membrane filter from the roof of the Chemical Engineering Building. Analysis is by neutron activation.

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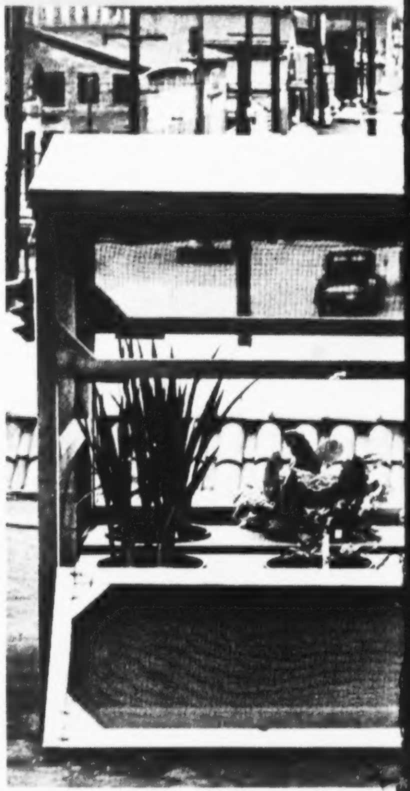
Air Pollution Measurements and Control
Engineering Aspects of Environmental Health
Power Plant Engineering
Combustion and Flames

Research facilities at Georgia Tech include the Micromeritics Laboratory specializing in investigation of finely divided materials, surface chemistry and physics, nucleation and cloud behavior, aerosol generation and atomization; Analytical Instrumentation Laboratories featuring electron microscopy, X-ray diffraction and fluorescence, emission spectroscopy and infrared spectrophotometry; Aerobiology Laboratory with chambers for the study of airborne bacteria; Radioisotope Laboratory; Radiation Biology Laboratory; and the Nuclear Research Center.

For additional information, write to: Dr. Michael J. Matteson, School of Chemical Engineering, Georgia Institute of Technology, Atlanta, Georgia 30332.

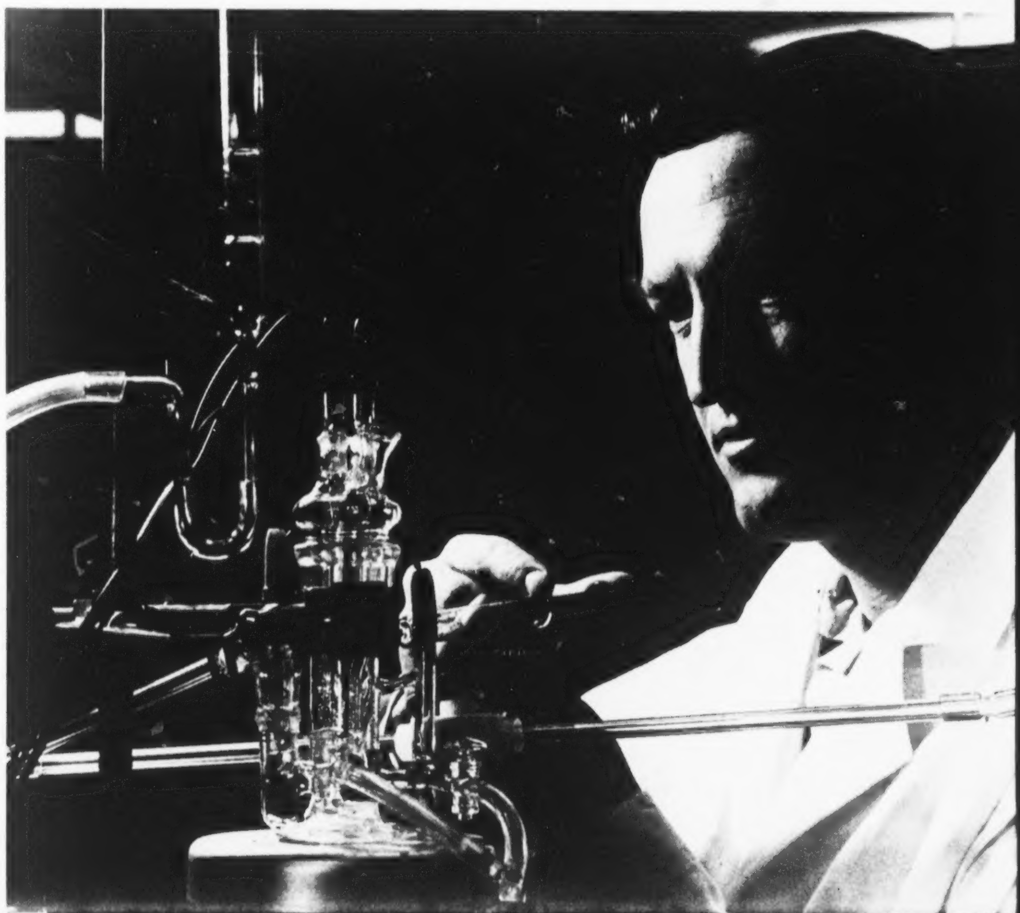
Controlled atmosphere plant growth chambers used in studies of the effects of selected air pollutants on plant growth, yield, and metabolism.



Study in urban location to show the
of selected air pollutants.

(below right) Injection of sample into microcoulometric cell used to determine concentration of sulfur-containing gasses.

(far right) Smog-forming potential of terpenoid emanations from plant foliage determined under exposure to ultraviolet radiation.



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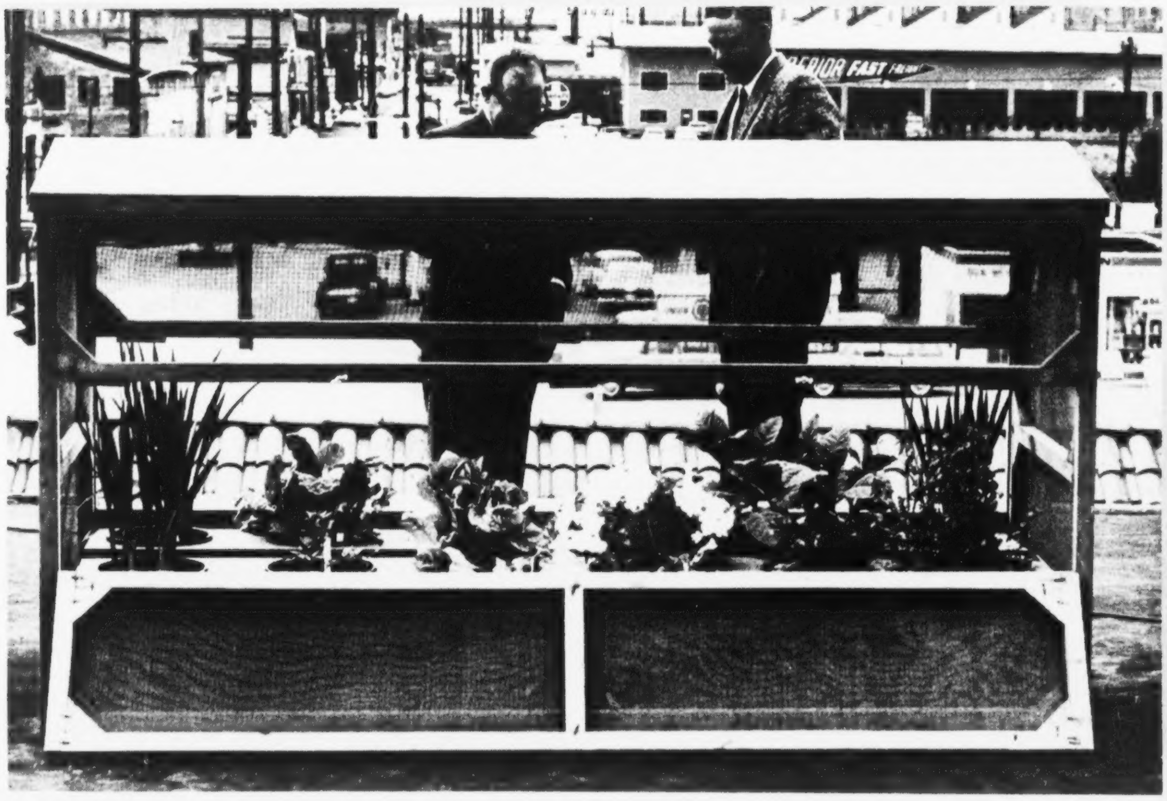
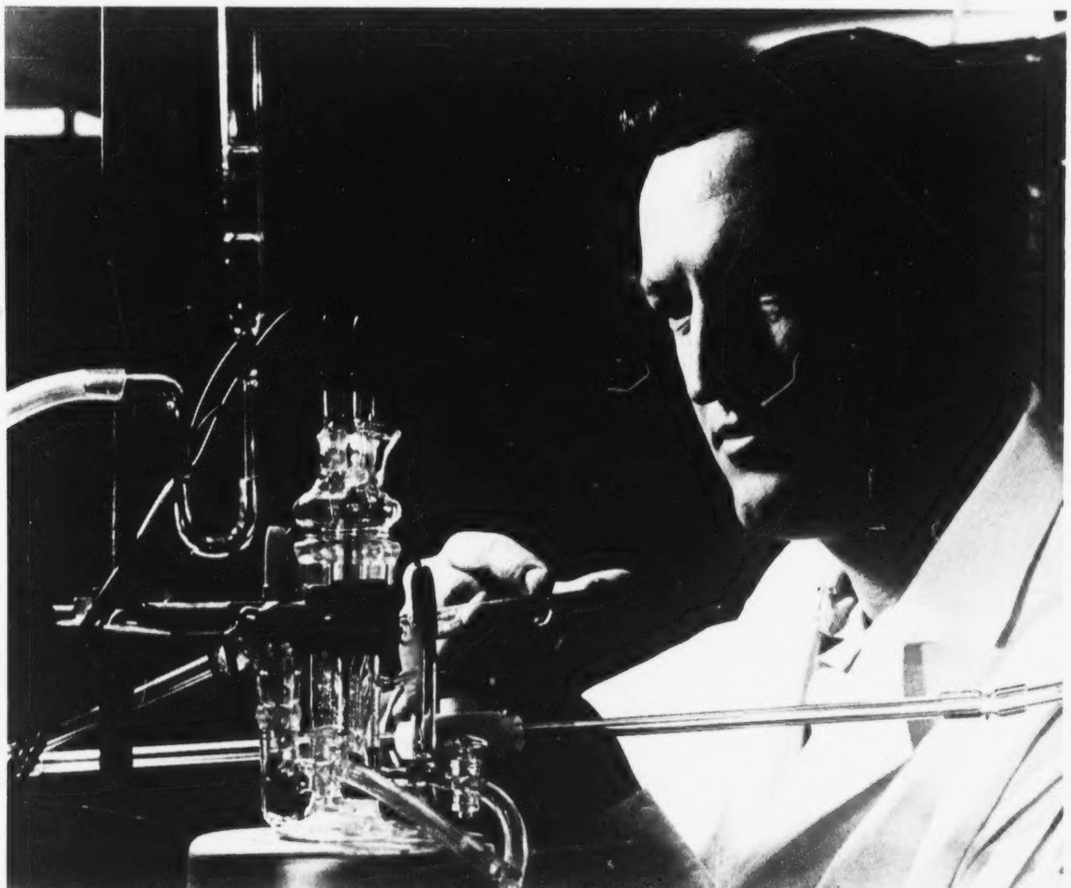
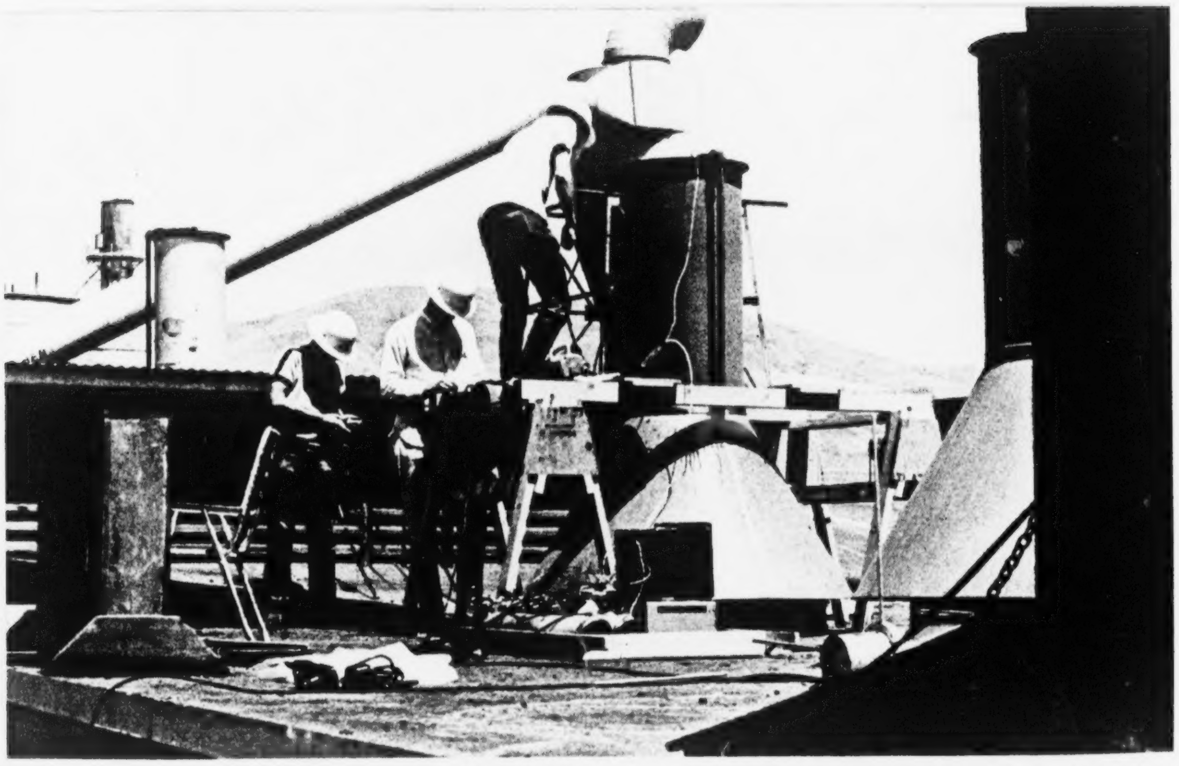


Study in urban location to show the usefulness of selected species of vegetation as indicators of selected air pollutants.





Field team takes samples from a veneer dryer stack to determine the chemical and physical characteristics of the emissions.

Aircraft specially equipped for realtime measu
tions and meteorological factors in flight over U.

Washington State University Pullman, Washington

Washington State University offers a multidisciplinary air pollution graduate program for students seeking the M.S. degree. The objective of this flexible program is to develop the student's ability to deal actively with air pollution problems in industry and control agencies. The program is sponsored by the Department of Civil Engineering in cooperation with the University's Environmental Science Program. The curricula are individually planned for graduates in engineering, agriculture, natural or physical sciences, as well as economics, business administration, and government. For engineers, studies will emphasize control technology.

Students may either work toward the Master of Science degree in Sanitary Engineering or Environmental Science or enroll in selected air pollution courses while working toward the M.S. degree in a wide range of cooperating major fields of study. In this latter curriculum, the student enrolls in courses pertinent to his major field of study and selected air pollution courses. Requirements for the M.S. degree, which can be completed in 12 months, include 24 semester hours of course work plus a thesis or 32 hours of course work.

The air pollution option is based upon five core courses totaling 11 hours, and a weekly seminar which are:

Fundamentals of Air Pollution
Air Pollution Measurement Techniques
Air Pollution Meteorology
Air Pollution Abatement and Administration
Air Pollution Control Engineering
Environmental Science Seminar

A minimum of 11 additional hours of study will be selected from suitable electives such as:

Statistical Methods
Processing of Scientific Information
Information Structures
Modeling and Simulation of Biological Systems
Public Administration

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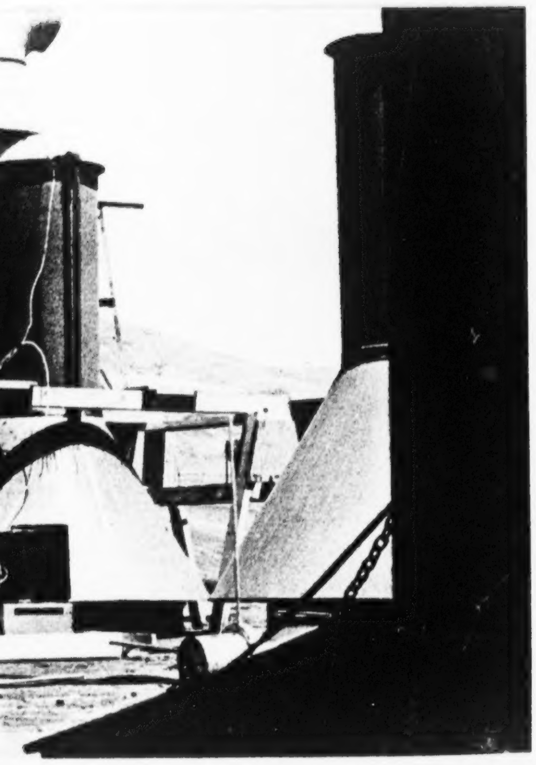

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Aircraft specially equipped for realtime measurement and recording of pollutant concentrations and meteorological factors in flight over U. S. Forest Service experimental slash burn.

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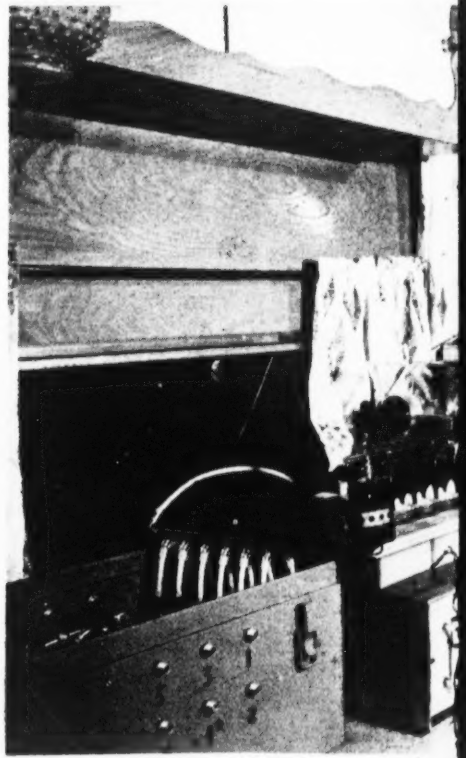
Information Structures
Modeling and Simulation of Biological Systems
Public Administration
Administrative Law and Regulations
Autecology
Synecology
Industrial Instruments
Resource Economics

Well-equipped air pollution laboratories are available for specialized study and research in odor perception, airborne real-time measurements of pollutant dispersion, atmospheric photochemistry, fluorine phytotoxicity, sulfur-containing gases, and instrumental analysis. The present five-member faculty combines 67 years of industrial research and academic experience in air pollution and closely allied fields. The University also has available supporting facilities including an IBM 360 Model 67 computer, four electron microscopes, and a 1-megawatt nuclear reactor.

For additional information, write to the Program Director: Professor Donald F. Adams, Air Pollution Research, Dana Hall, College of Engineering, Washington State University, Pullman, Washington 99163.

Chemist installs tape in aircraft magnetic tape data recorder.



Interior of mobile trailer laboratory, u
field sites.

(right) A student observer measures the precipitation collected in the standard 8" gauge. The tipping bucket recording rain gauge is in the background at the Rutgers CAES weather station operated by the Meteorology Department.

(far right) A Rutgers professor and student observer inspect the evaporation pan at the weather station of the College of Agriculture and Environmental Science. The precipitation gauge and instrument shelter can be seen at the right and the wind tower is in the background.

Interior of mobile trailer laboratory, used to determine air pollution concentrations at selected field sites.

Specialists Training Programs

GENERAL INFORMATION

There are presently twelve programs oriented to various academic levels designed to train air pollution control specialists. The areas stressed in these programs range from the administrative to the technical aspects of air pollution control. Application for financial assistance in any of the following programs should be sent directly to the program director of the specialists program.

University of Southern California
Los Angeles, California

This 3 month program is designed to train air pollution control administrators and is sufficiently flexible, in scope and depth, to produce a working understanding of the administrative aspects of air pollution control concepts and operations. In addition, a review of the engineering, physical sciences, and biological-medical elements provides an appreciation of the technical components related to air pollution control.

Each program includes workshops based on four core courses, plus one weekly seminar at the university, coupled with field investigations and study visits to industries, laboratories, and other operating and research agencies. Specifically, field training includes investigation of complaints, laboratory analysis of contaminant samples, and the evaluation of pollution control systems.

Seminar and field exercises are integrated throughout the program to allow comparison of theory and practice and to promote comprehension of the interrelationships between administration and technology. In addition to lectures, discussions, and field exercises; learning techniques include a computer-based management simulation exercise (Apex), decision-making games, and role-playing and case-study analysis. In lieu of a dissertation, qualified applicants can earn up to 12 hours of graduate credit toward a graduate degree in public administration.

Institutes are held three times each year as follows:

- March – May
- July – September
- November – January

For additional information, write to the Program Director: Miss Gloria G. Barbaro, Air Pollution Control Institute, University of Southern California, Civic Center Campus, 311 South Spring Street, Los Angeles, California 90012.

Portland State
Portland, Oregon

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For additional information, write to the Program Director: Miss Gloria G. Barbaro, Air Pollution Control Institute, University of Southern California, Civic Center Campus, 311 South Spring Street, Los Angeles, California 90012.

Portland State College

Portland, Oregon

The Department of Applied Science offers a program of training in air pollution control at the baccalaureate and master's levels.

Undergraduate students in the physical sciences participate in the program by selecting air pollution courses as electives. Their training includes air conservation and meteorology, studied in their junior and senior years respectively. In the intervening summer they devote a 10-week period to in-service training with a local air pollution control agency.

Graduate students take the full sequence of air pollution control courses, plus approved electives suitable for their academic background. The M.S. degree program requires a thesis.

Air pollution related courses offered in this program include:

Introduction to Air Conservation
Aerosol Technology
Atmospheric Reactions
Air Pollution Instrumentation
Projects in Air Pollution
Air Pollution Seminar
Meteorology

For additional information write to the Program Director: Dr. Frank P. Terraglio, Associate Professor of Applied Science, Portland State College, P. O. Box 751, Portland, Oregon 97207.

University of California Riverside, California

The program offered by the Department of Life Sciences, University of California, Riverside, is an undergraduate research training program. Undergraduates participate in a research program for a 10-week summer period and usually continue activities, to a limited degree, during the academic year. The purpose of the program is to orient and involve science students with the specific biological problems related to air pollution control, to teach modern techniques of biological research, and to demonstrate how these techniques can be used to outline and solve relevant air pollution problems.

A unifying seminar series during the summer period teaches the trainees how their specific interests are related to air pollution control and acquaints them with specific air pollution problems. Students in the program are encouraged to take advantage of a new series of courses, offered under the grouping of "Biology and Modern Man," which are presented in a context of such comtemporary problems as environmental pollution and a disturbed ecology. In addition, every quarter one seminar course is offered that deals with chemical and biochemical characterization of environmental contaminations and related ecological and public h

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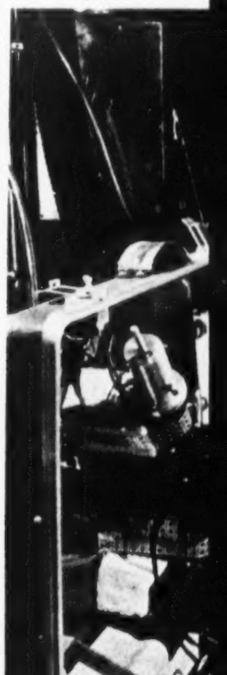
(right) Associate degree students in Air Pollution Control Technology at Penn State learn to repair, calibrate, install, and operate various types of air sampling and monitoring equipment.

(far right) An air pollution technician uses his specialized training to aid in the development of a prototype dust monitoring instrument in the Aerosol Labs of the Center for Air Environment Studies at The Pennsylvania State University.



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The goal of this program is to introduce future biological scientists to the modern techniques of biological research and to clearly demonstrate how these techniques can be used to solve current and future air pollution problems.

For additional information, write to the Program Director: Irwin P. Ting, Associate Professor of Biology, Department of Life Sciences, University of California, Riverside, California 92502.

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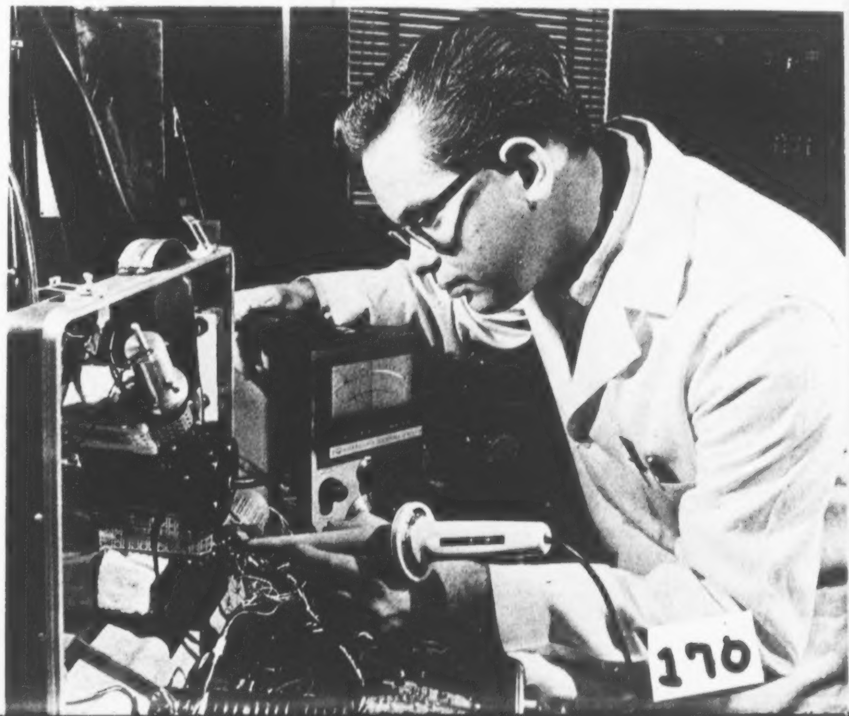

Two mobile laboratories and a sampling tower are used for field studies by Penn State's air pollution trainees.

Pennsylvania State University

Berks Campus Wyomissing, Pennsylvania

The Berks Campus offers a two-year associate degree program in air pollution control technology. Specialized and applied coursework in air resource management, air sampling and monitoring, air analysis instrumentation, and air pollution meteorology are offered, supported by appropriate chemistry, physics, mathematics, electronics, engineering, and instrumentation courses and laboratories.

Graduates of this program will be prepared to calibrate, install, and operate air sampling and monitoring equipment, investigate air pollution complaints, inspect plants, evaluate pollution sources, and perform preliminary data analyses.

Admission to the program initially is based upon high school records and student aptitute test scores indicating potential ability in an engineering technology program. Support is available for the last four terms of this six-term program based on achievement and career potential.

For further information, write to the Program Director: Dr. William J. Moroz, Center for Air Environment Studies, 226 Chemical Engineering Building II, University Park, Pennsylvania 16802.

Pennsylvania State University

University Park, Pennsylvania

This program is designed for persons from control agencies or from industry who wish to formalize their education in air pollution or who wish to change job orientation. Some juniors and seniors in college who wish to pursue air pollution careers are admitted to the course. Up to eight credit hours may be earned during 10 weeks of intensive training in engineering and the physical sciences and the biomedical, socioeconomic, and administrative areas. Non-engineering majors are given a special engineering and physical sciences unit to review the chemical and physical principles commonly applied to air pollution control.

A basic criteria for selection is the applicant's interest in a career in air pollution control; however, his background in science, especially basic chemistry, physics, and mathematics, or equivalent experience will also be evaluated.

For further information, write to the Program Director: Dr. William J. Moroz, Center for Air Environment Studies, 226 Chemical Engineering Building II, University Park, Pennsylvania 16802.

Oregon Technical Institute

Klamath Falls, Oregon

Air pollution control technicians are trained in a 2-year associate degree program supported in part by a supplement to the grant to Oregon State University. Special emphasis is placed upon the training of air pollution control technicians. Students receive a sound foundation in basic sciences and instruction in air pollution measurement techniques. Standardization of sampling and analytical techniques for all common air pollutants is emphasized. High school graduates or junior college students may contact Associate Professor E. A. Wellman, Department of Environmental Health Technology, Oregon Technical Institute, Klamath Falls, Oregon 97601.

Pennsylvania State University

University Park, Pennsylvania

This program is designed for persons from control agencies or from industry who wish to formalize their education in air pollution or who wish to change job orientation. Some juniors and seniors in college who wish to pursue air pollution careers are admitted to the course. Up to eight credit hours may be earned during 10 weeks of intensive training in engineering and the physical sciences and the biomedical, socioeconomic, and administrative areas. Non-engineering majors are given a special engineering and physical sciences unit to review the chemical and physical principles commonly applied to air pollution control.

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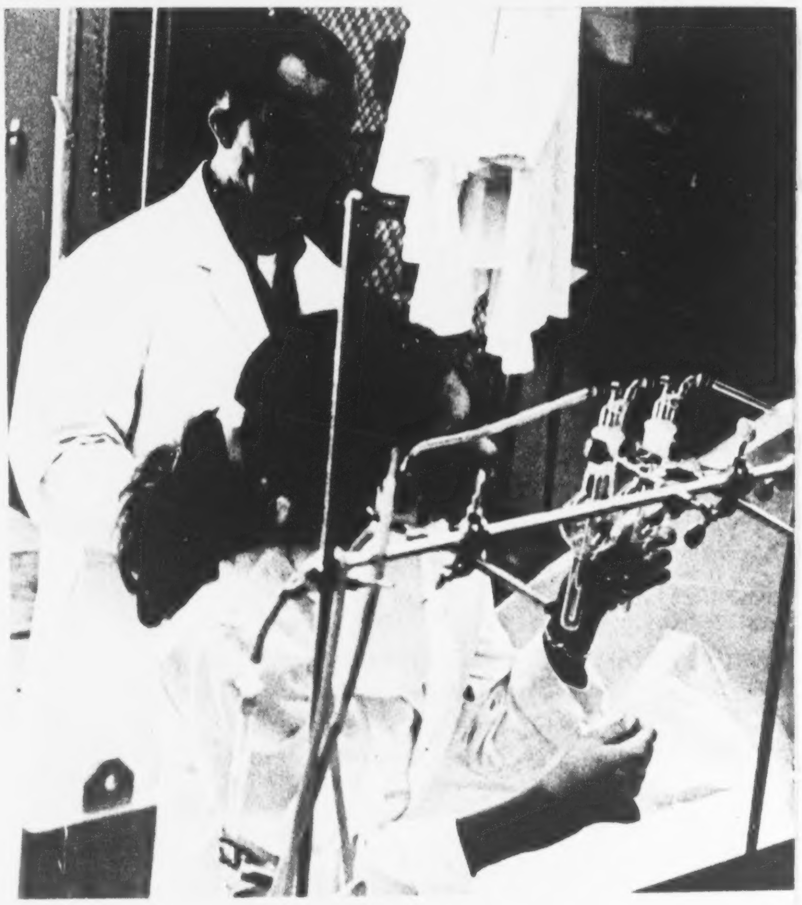

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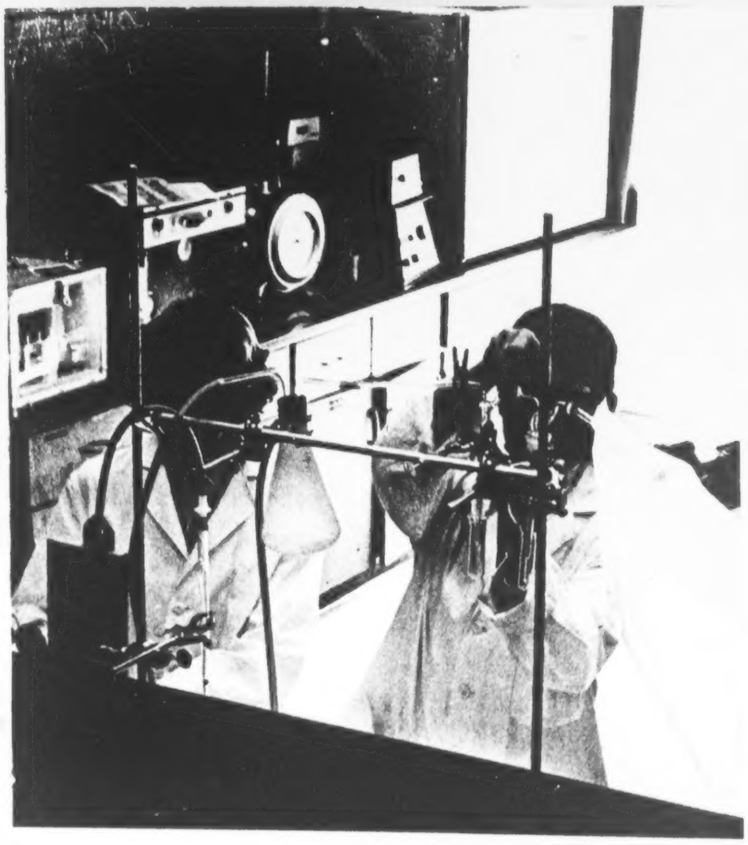

Fayetteville Technical Institute   Fayetteville, North Carolina

The Environmental Engineering Technology Department at Fayetteville Technical Institute offers a highly specialized program for air pollution control personnel. It is the only such two-year curriculum taught in North Carolina. Students in this program achieve skills in detection and analysis of factors related to environmental pollution problems and are introduced to methods of prevention and control of conditions leading to air pollution.

A graduate of F.T.I.'s environmental program is prepared to enter one of the fastest growing fields in the country. He has a knowledge of laboratory procedures as well as of techniques in testing liquid and solid wastes, food, water, and air pollutants. Among the air pollution control related courses are environmental sanitation, air quality management, and air pollution sampling.

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(above right) Preparing an air sample test at Fayetteville Technical Institute, these students are shown working with some of the available equipment. In the background are a tri-craft sampler for gaseous pollutant sampling and a wet test meter.

(above left) Fayetteville Tech students prepare for an analysis of ambient air samples through an air pollution sampling train. The pollutant to be measured is taken from the bag at the right.

(below left) Microscopy — Fayetteville Tech student is shown sizing particulates from a filter taken from a high volume sampler.

(right) "The Propane Gasser", a prize winning entry in the "Clean Air Car Race."

Worcester Poly

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Fayetteville Technical Institute Fayetteville, North Carolina

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A two-year, college-level program encompassing a total of 111 quarter hours, environmental engineering technology is accredited by the Engineer's Council for Professional Development as an engineering technology curriculum, and leads to an associate degree. Transfer credit to a four-year institution may be arranged on an individual basis.

Fayetteville Tech's environmental engineering technicians are employed in municipal, county, State, and Federal agencies in addition to working in sales and service with private industries concerned with air pollution problems.

For additional information, write to: Dean Painter, Fayetteville Technical Institute, Box 5236, Fayetteville, North Carolina 28303.

Worcester Polytechnic Institute

Worcester, Massachusetts

The Environmental Systems Study Program (ESSP) is a project-based undergraduate study plan built upon contemporary environmental problems. Using the systems approach, the development of a solution to those problems provides the main thrust of the student learning experience. Special emphasis is placed upon air pollution control problems encountered by government and industry.

Interdisciplinary project teams are selected from engineering, science, and social science students in their junior year. Teams, consisting of three-to-five students under the direction of a faculty advisor, pursue the following study sequence:

Spring Term – Preparatory Course
Students study general environmental problems, project management, systems analysis and design techniques. The laboratory portion of this course

serves to familiarize the student with equipment and techniques in preparation for his participation in a project.

Summer Term – Internship
Students execute project objectives outlined during the preparatory course.

Senior Year – Design
Students will take two in-depth courses dealing with the solution of the problem: one from the disciplinary point of view and the other in the overall systems concept.

Reporting – upon completion of the sequence the student group submits written and oral reports of their findings and solutions to the faculty and sponsors.

Elective Courses – concurrent with the project sequence described above, students individually choose electives from courses offered by Worcester Polytechnic Institute and environmental courses offered at neighboring institutions of the Worcester Consortium for Higher Education.

A student establishes a sub-major by studying a sequence of five or more courses chosen from those offered in the environmental areas. This sequence supplements his disciplinary major and enables the graduate to function as an environmental specialist within his chosen career.

For additional information, write to Program Director: Dr. Imre Zwiebel, E.S.S.P., Worcester Polytechnic Institute, Worcester, Massachusetts 01609.

WPI ELECTRIC HYBRID

A top prize winner in the "Clean Air Car Race", this electric hybrid could be a prototype of the family car in your future.

California State Polytechnic College students gain experience through field studies.

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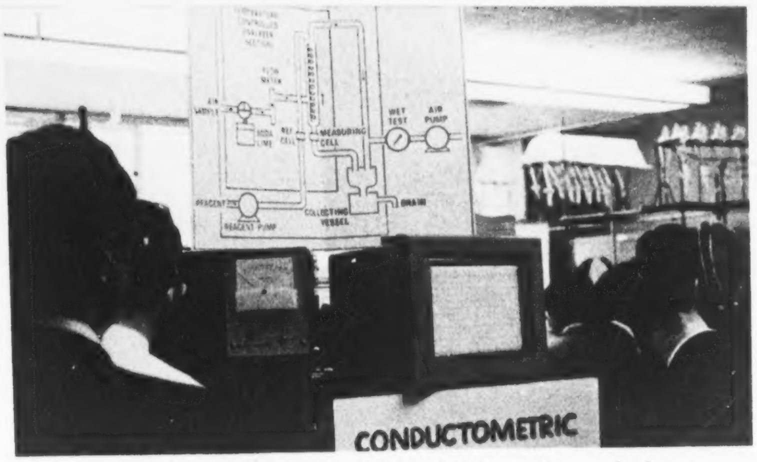
California State Polytechnic College San Luis Obisp

The Environmental Engineering department of the California State Polytechnic College offers a program in air pollution control which leads to a Bachelor of Science degree. Students are trained in basic science and engineering with strong emphasis on chemistry and specific work in the design, control, and effects aspects of environmental quality. Laboratory experiments and field exercises are emphasized. The program includes the following air pollution courses:

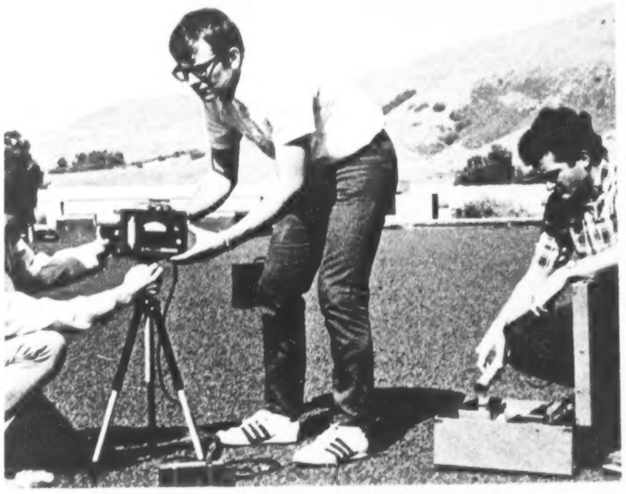
Meteorology, I and II
Industrial Environments

WPI ELECTRIC HYBRID

A top prize winner in the "Clean Air Car Race", this electric hybrid could be a prototype of the family car in your future.



Discussion of the operating principles of SO_2 analyzer during a California State Department of Public Health training conference.



California State Polytechnic College students gain experience through field studies.

California State Polytechnic College faculty member discussing laboratory measurements with students.

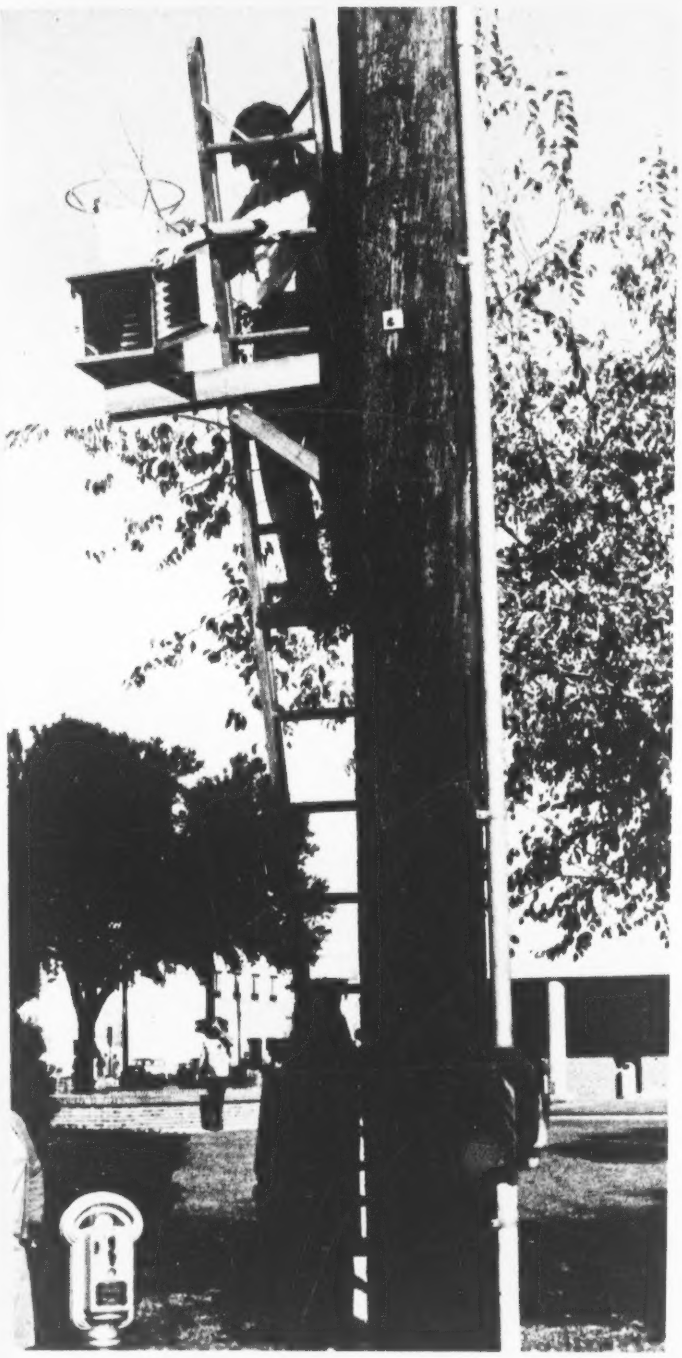
California State Polytechnic College San Luis Obispo, California

The Environmental Engineering department of the California State Polytechnic College offers a program in air pollution control which leads to a Bachelor of Science degree. Students are trained in basic science and engineering with strong emphasis on chemistry and specific work in the design, control, and effects aspects of environmental quality. Laboratory experiments and field exercises are emphasized. The program includes the following air pollution courses:

Meteorology, I and II
Industrial Environments
Introduction to Air Pollution
Air Pollution Measurements
Environmental Radiation Surveillance
Air Pollution Control

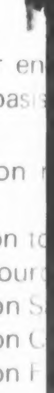
Graduate work leading to a Master of Engineering degree will be offered beginning in the fall of 1970.

For additional information, write to the program director: Dr. Harold M. Cota, Associate Professor, Environmental Engineering, California State Polytechnic College, San Luis Obispo, California 93401.



Field study with an ambient sampling shelter at Santa Fe Junior College.

(above) Portland State College's Science II will include two levels of underground parking, plus tour levels of integrated science laboratories and classrooms.



Santa Fe Junior College
Gainesville, Florida

Santa Fe Junior College offers a 2-year training program in air pollution technology designed to produce technicians to work in industry and various health facilities.

The program includes the elements of a general college education, mathematics, chemistry, physics, and biology, with specialized training courses in air pollution control technology which are supplemented by participation in a continuing county-wide air pollution survey designed to provide field experience.

Approximately 75 course hours qualify the graduate for the Associate of Arts degree.

A special option for students interested in a 4-year program leading to a Baccalaureate degree in one of the science or en
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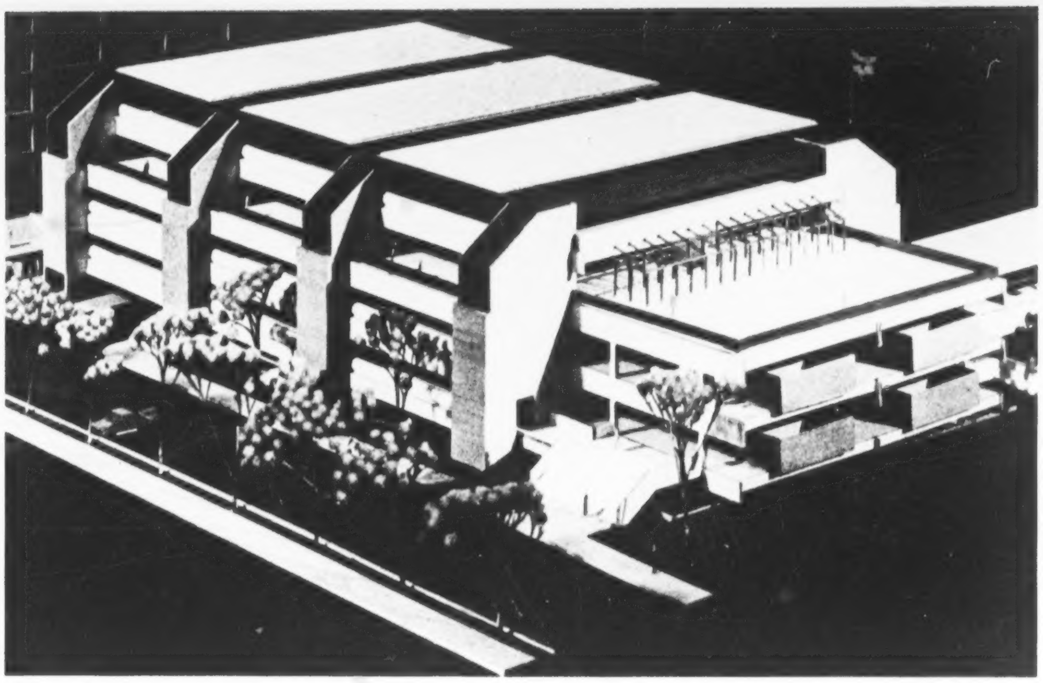

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The program includes the elements of a general college education, mathematics, chemistry, physics, and biology, with specialized training courses in air pollution control technology which are supplemented by participation in a continuing county-wide air pollution survey designed to provide field experience.

Approximately 75 course hours qualify the graduate for the Associate of Arts degree.

A special option for students interested in a 4-year program leading to a Baccalaureate degree in one of the science or engineering fields can be arranged on an individual basis.

Air pollution related courses offered in this program include:

Introduction to Air Pollution
Pollution Sources
Air Pollution Sampling
Air Pollution Control
Air Pollution Field Survey

For further information, write to the Program Director: Mr. Robert W. Sterling, Director, Engineering Occupations Programs; or to Mr. John M. Turner, Instructor, Santa Fe Junior College, 723 West University Avenue, Gainesville, Florida 32601.

California State Department of Public Health

Berkeley, California

The program offered by the California State Department of Public Health provides advanced and specialized education and training. It emphasizes successful current practices and new analytical methods for assessing indoor and outdoor air pollution, focusing on specific problem areas each year.

A two-day plenary session is planned at which opportunities for formal lectures and informal discussion groups will be made available. This will be followed annually by three regional laboratory workshops, which will provide the advantages of very small group interactions. Recurring topics include maintenance and calibration of air sampling and analysis instrumentation designed for gases and aerosols, and methods for solving analytical problems related to industrial hygiene. Workshops and lectures are integrated to clarify the chemical and physical principles relevant to the significant differences caused by good and poor practices.

The program is presented with the participation and cooperation of the California Air Resources Board and the California State Department of Public Health, Berkeley, and is intended for the technical staffs of air pollution control agencies, health departments, educational institutions, instrument manufacturers and vendors, physicians, industries, and other public or private agencies concerned with air pollution problems.

For additional information, write to: Dr. Peter K. Mueller or Edward Jeung, California State Department of Public Health, 2151 Berkeley Way, Berkeley, California 94704.

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Scientists working with continuous analysis instrumentation.

Changing the filter on the high volume sampler in operation on the roof of a Sullivan County Community College building.

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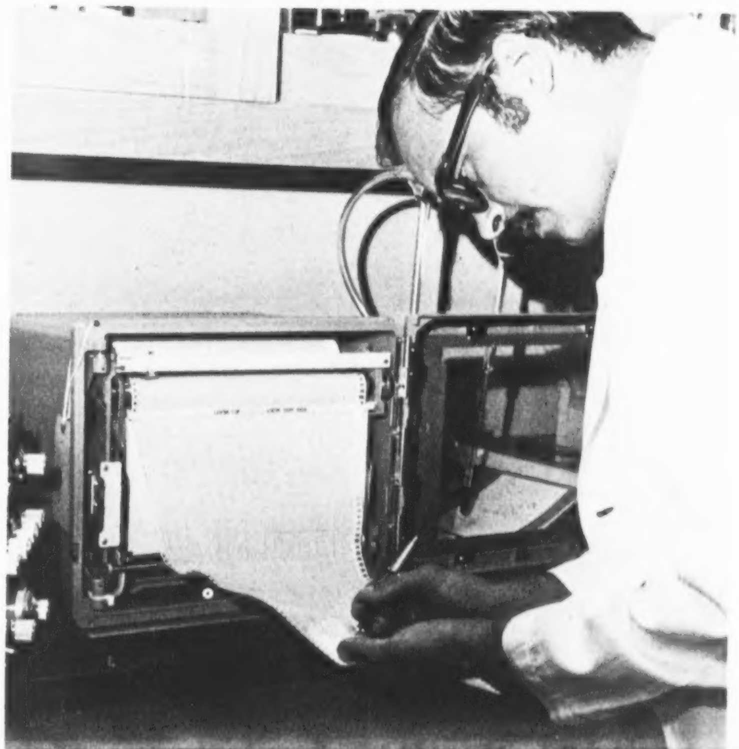

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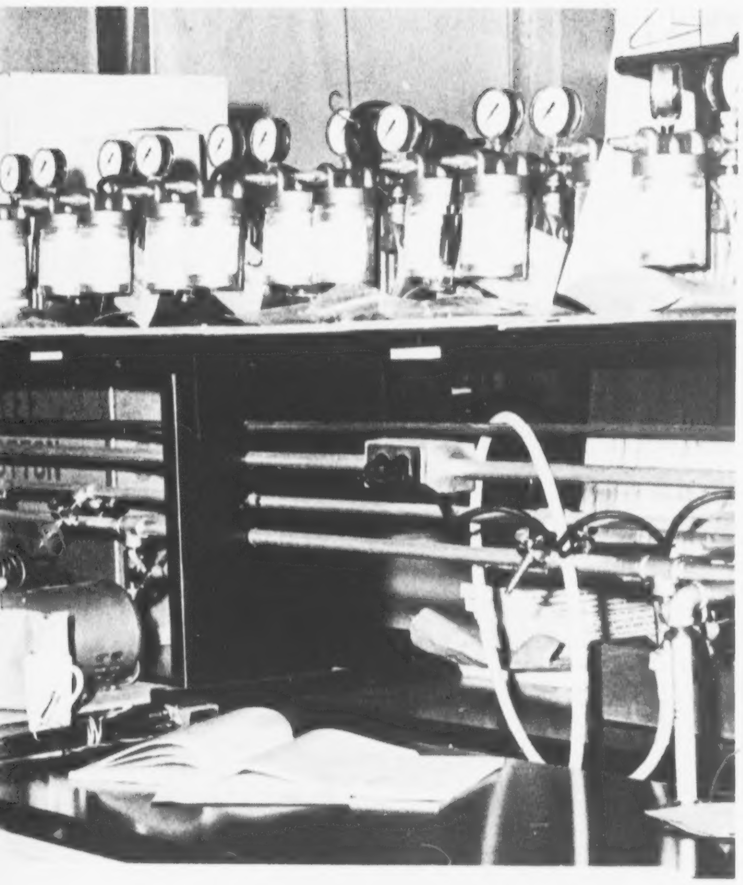

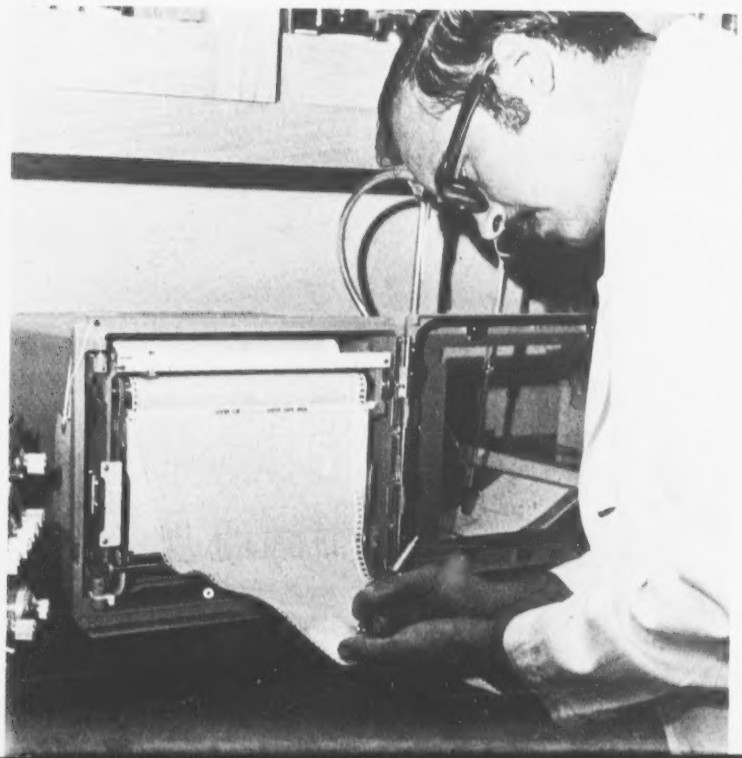

Sullivan County Community College

South Fallsburg, New York

Sullivan County Community College is offering a special opportunity for pollution control training. During the first year, students take laboratory courses in air and water sampling and analysis that provide skills needed for entry-level technician positions in air and water pollution control. Upon receiving a diploma after the first year, the student may continue on for a second year of more general studies leading to an associate degree in applied science.

The most modern equipment, including a mobile pollution control laboratory for field work, is available. A high school diploma is not required for admittance to the program. For further information and applications write to: Mr. Lawrence Appel, Admissions, Sullivan County Community College, South Fallsburg, New York 12779.

(top) New vacuum pumps, checked upon arrival to be used in air analysis laboratory studies.

(far left) A sample is injected into intake tube of a gas chromatograph in a laboratory at Sullivan County Community College.

(left) Examination of strip chart used with the gas chromatograph.

FELLOWSHIPS

General Information

As authorized by the Clean Air Act of 1970, the Environmental Protection Agency's Office of Air Programs has established a grants-in-aid program to increase the number and competence of professional personnel engaged in research and other activities related to the prevention and abatement of air pollution.

A limited number of fellowships for post-masters level study in such fields as urban and transportation planning, economics, political science, public affairs, and legal aspects of air pollution control are available to scholars desirous of obtaining such specialized training. In addition, one year fellowships will support individuals seeking a Masters Degree in air pollution control and related fields of study with priority being given to personnel employed by State or local air pollution control agencies.

Air pollution fellowships are awarded and administered in accordance with the following policies and procedures.

Requirements:

A fellow must be a citizen of the United States, a non-citizen national of the United States, or have been lawfully admitted to the United States for permanent residence. An applicant who is not a United States citizen or a non-citizen national must request the Office of the Immigration and Naturalization Service nearest his residence to verify that he was lawfully admitted to the United States for permanent residence. The
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Qualifications

To qualify for a fellowship, an applicant must have a bachelor's degree from a recognized institution or equivalent experience, and must be accepted for admission by an appropriate educational institution.

In awarding the fellowship, consideration will be given to the adequacy, value and appropriateness of the program to be followed, the orientation of the research, and the qualifications, interest, and potential contribution of the applicant.

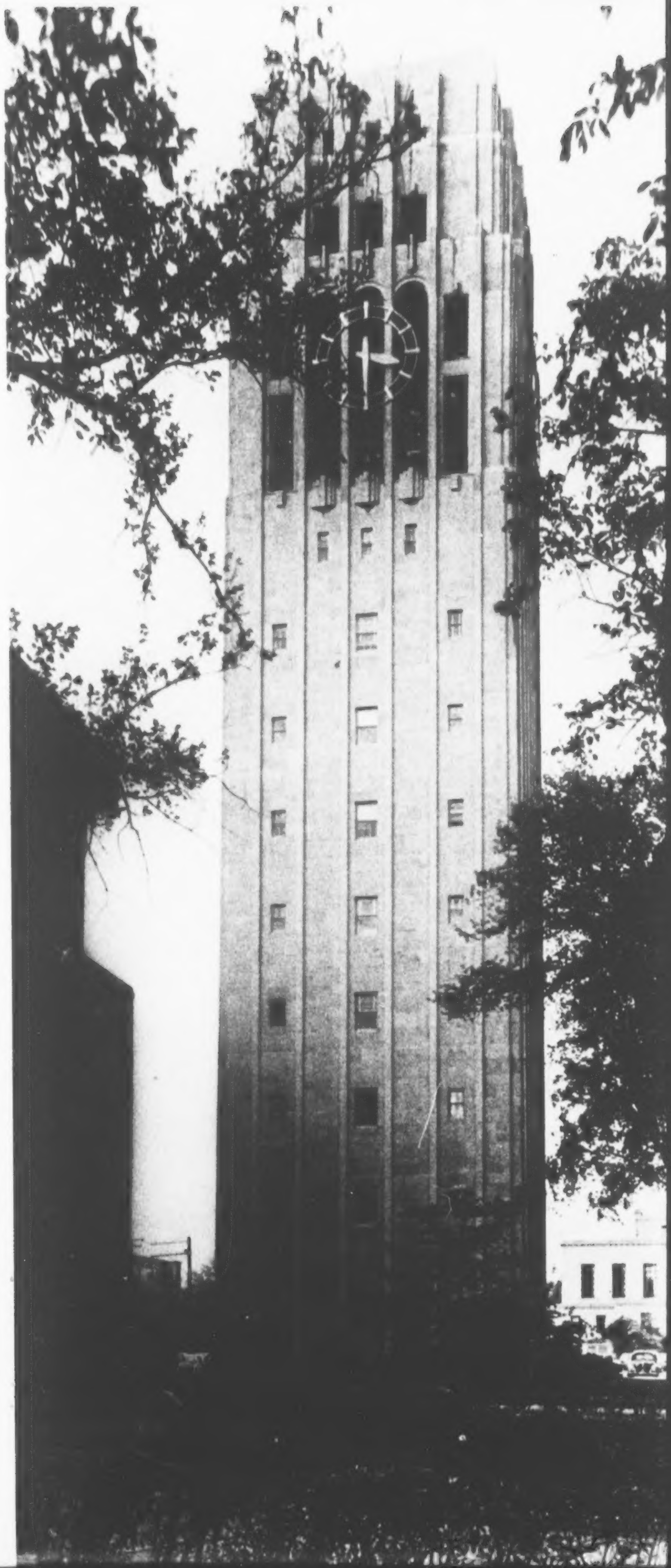
Terms of Support

Fellowships are awarded on a 12-month basis. The fellow is expected to pursue a full-time training program. If support is desired for more than one year, justification of the additional training should be furnished at the time the initial application is made. Support for additional training will, in all cases, depend upon a satisfactory progress report from the sponsor and the availability of funds appropriated by the Congress for this program.

How to Apply

Applications for air pollution fellowships may be obtained from any of the ten Regional Offices of the Environmental Protection Agency (listed pp. 16-17) or from the Chief, Extramural Programs Branch, Office of Manpower Development, Office of Air Programs, Post Office Box 12055, Research Triangle Park, North Carolina 27709.

Notification is given approximately two weeks after review of application.



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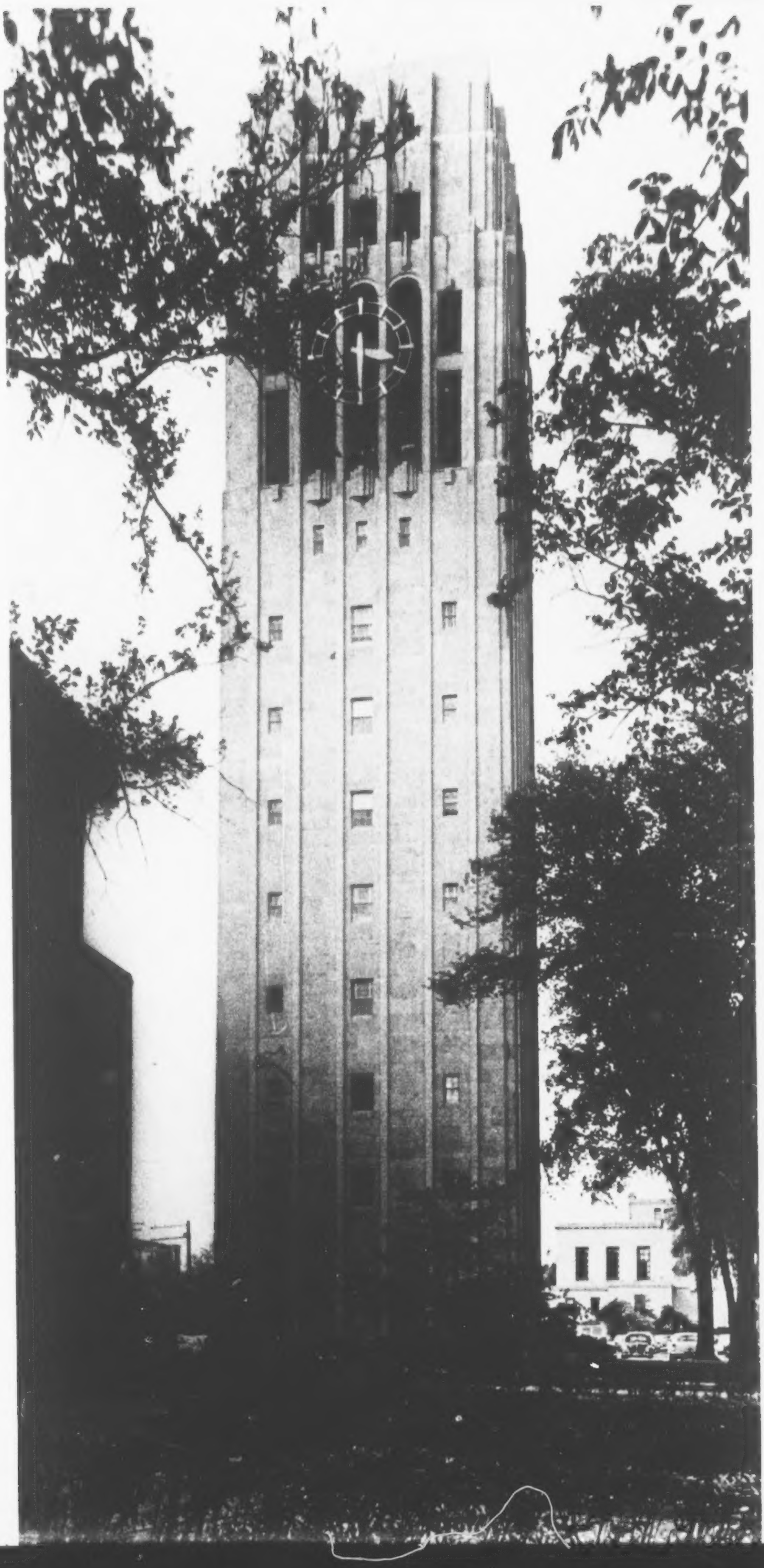

No tuition or registration fee is charged.

Early application is advised, because course ro
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APPLICATION FOR INSTITUTE FOR AIR POL TRAINING COURSES

● **Please fill out both sides of the application for**

● **A separate form for each c**

Additional application forms may be obtained
(see pages 16 and 17) or fron
of the Institute for Air Pollution Training

● **Please mail forms to:**

Registrar,
Institute for Air Pollution
Research Triangle Park, N
Telephone: (919) 549 - 8

No tuition or registration fee is charged.
Early application is advised, because course rosters are limited.
Trainees are expected to provide for their own housing and transportation while attending courses.
To provide training service to a maximum number of organizations,
the number of applicants from a single agency, for any one course, may be necessarily limited.

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● **Please fill out both sides of the application form.**

● **A separate form for each course is requested.**

Additional application forms may be obtained from any Regional Director
(see pages 16 and 17) or from the Registrar
of the Institute for Air Pollution Training

● **Please mail forms to:**

Registrar,
Institute for Air Pollution Training,
Research Triangle Park, North Carolina 27711
Telephone: (919) 549 - 8411

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Environmental Protection Agency

COURSE APPLICATION FORM

1. **Name of Applicant:** Mr. Miss Mrs. ____________________ (last)

2. **Course desired:**
Course Title ____________________
Place where given ____________________

3. **Previous courses attended:**
Course Title ____________________
Course Title ____________________
Course Title ____________________

4. **Sponsor or Employer:**
____________________ (name of organization or fir
____________________ (street address)
(city) ____________________ (state)

5. **Mailing address of applicant:**
(if different from above)
____________________ (street address)
(city) ____________________ (state)

Please fill c

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Agency

Form Approved
OMB
No. 158-R0005

APPLICATION FORM

Mr.
Miss ______ (last) ______ (first) ______ (middle initial)
Mrs.

Course Title ______ Course No. ______

Place where given ______ Dates ______

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Course Title ______ Dates ______

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(city) ______ (state) ______ (zip code) ______ (telephone) ______

● **Please fill out both sides of the application form.**

● **Certificates will be awarded to those students who satisfactorily complete all course assignments and who attend all scheduled presentations (including where applicable, evening, Friday afternoon and Saturday sessions).**

6. **Professional Status:**

(profession or occupation)

(position title)

● Brief description of your present position

7. **Education:**

Number of years education completed beyond high school

(college or university) (date attended) (Major) (Degree)

8. **Professional Experience:**

Total years experience in profession, including all public health experience

● **Total years of air pollution control experience**

(Signature of Approving Officer (where applicable)) Title

Signature of Applicant Date

● **Mail to:** Registrar,
Institute for Air Pollution Training
Research Triangle Park, North Carolina 27711
Telephone: (919) 549-8411

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Environmental Protection Agency

COURSE APPLICATION FORM

1. Name of Applicant: Mr. / Miss / Mrs. ______ (last)

● **2. Course desired:**

Course Title ______

Place where given ______

Course Title ______

● **3. Previous courses attended:**

Course Title ______

Course Title ______

4. Sponsor or Employer:

______ (name of organization or f

______ (street address)

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5. Mailing address of applicant:
(if different from above)

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(Signature of Approving Officer (where applicable)) Title

Signature of Applicant Date

● **Mail to:** Registrar,
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to be included on future mailing lists.

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Director,
Office of Manpower Development

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Institute for Air Pollution Training,
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Telephone: (919) 549 - 8411

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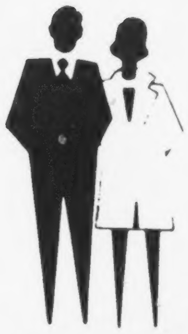

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Institute for Air Pollution Training
Research Triangle Park, N.C. 27711

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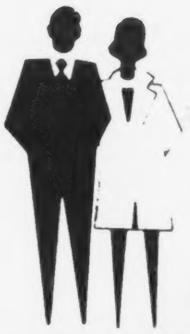

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(name of organization or firm)

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(city) (state) (zip code)

Mr.
Miss
Mrs. (last name) (first name) (middle initial)

(profession) (title)

(name of organization or firm)

Your new address

(street address)

(city) (state) (zip code)

Please mail both parts of change of address form
showing your old address and your new address to
Registrar,
Institute for Air Pollution Training
Research Triangle Park, North Carolina 27711